

*November 1932*

# TECHNOLOGY REVIEW



# technology review

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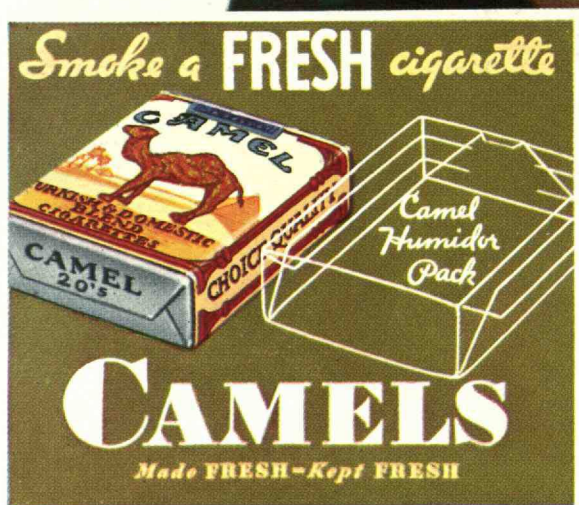


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## THE TABULAR VIEW

EVER since he obtained his B.S. and M.S. in 1900 and 1901, respectively, from the University of Pennsylvania, WALTER L. FLEISHER has specialized in heating and ventilating engineering. In 1908 he designed and installed the first air washer in a theater in the United States for the purpose of cooling, and he is the inventor of 20 or more United States and foreign patents in the field of air conditioning. EDWARD R. SCHWARZ, '23, is Assistant Professor of Textile Technology at M. I. T. As chairman of the board of editors of the United States Institute for Textile Research, he recently completed the compilation of a book on textile research, published by the Technology Press of M. I. T.

IN A paper delivered this fall at the New England meeting of the Society for the Promotion of Engineering Education, Dr. VANNEVAR BUSH, Vice-President of the Institute, said: "I am convinced that a just estimate of our pedagogical processes in engineering education today will conclude that in our undergraduate work we depart sadly from the true nature of professional education. The essential reason for this is that we have held to an antiquated system of a multitude of loosely connected subjects with their own fragmentary examinations. It is time that we progressed. The road is open in at least one direction by the gradual and guarded introduction of a system which will extend to the student self-determination in his academic activities, under wise and ever-present counsel, create an atmosphere of transition from the attitude of the schoolboy to that of the professional man, which will eliminate those who cannot stand the freedom of professional life, and nurture the individuality, initiative, and resourcefulness of those who can. . . ." Dr. Bush's conclusions might serve as an admirable introduction to the article "Educating for Responsibility" on page 52. The author of this paper, RICHARD H. FRAZIER, '23, is an Assistant Professor in the Department of Electrical Engineering at M. I. T., and for a number of years has acted as general counselor for the Honors Group Plan of the Institute's Department of Electrical Engineering.

JOEL B. COX is chief engineer of the McBride Sugar Company of Hawaii and it was under his direction that the Alexander Dam was designed and built. In an address delivered before the Engineering Association of Hawaii Mr. Cox said: "The story of the Alexander Dam may be taken as an example of the close interdependence of the art and the science of engineering. . . . The greatest triumphs of engineering *art* have come when the scientific element was most completely mastered and hence skillfully employed. The greatest progress in engineering *science* has always been the result of the need for exactitude felt by the greatest practitioners of the art. It is in the development of the *science of soil mechanics* and its application to the *art of earth-dam building* that the greatest importance of the Alexander Dam work must lie."



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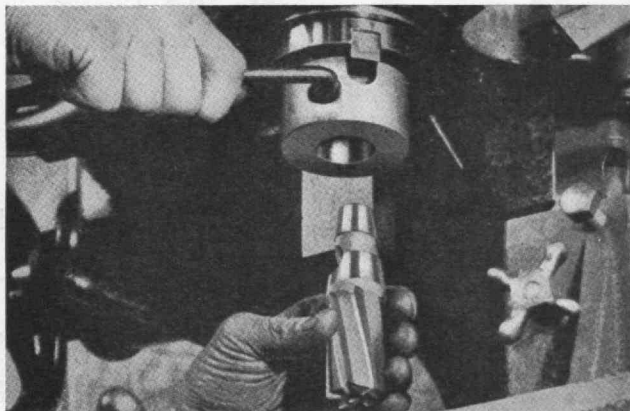
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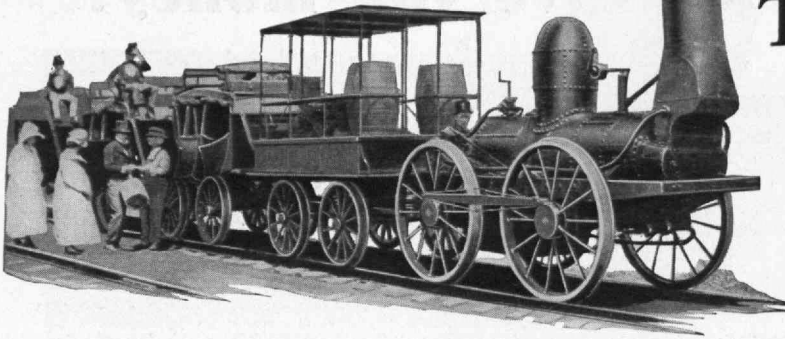
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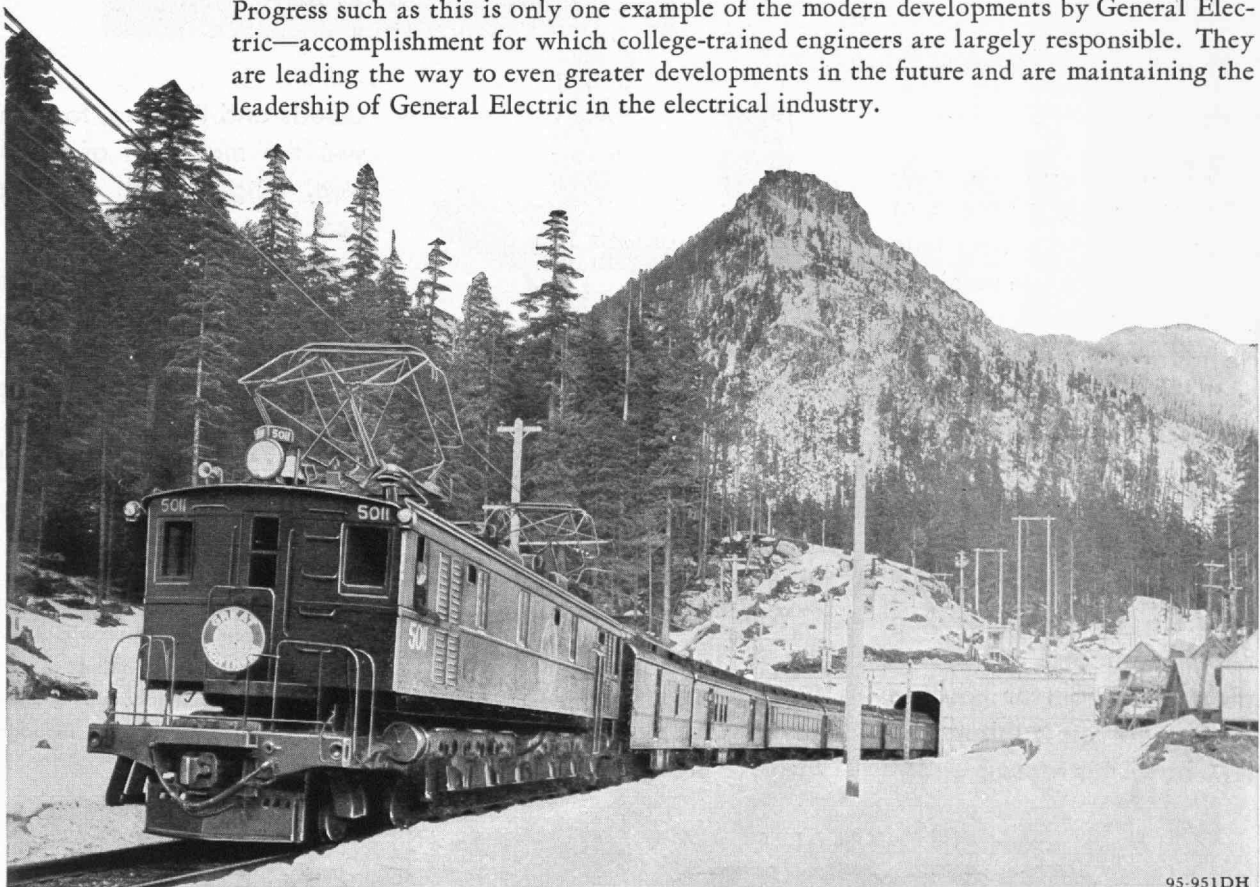


A RACE between the horse and the locomotive has started. The *De Witt Clinton*, that awesome "iron horse," is puffing and plodding away from Albany to Schenectady at the high rate of 22 miles per hour. The snorting monster, showering sparks and smoke all over its passengers,

frightens cattle and farmers' horses all along the way. The *De Witt Clinton* arrives in Schenectady, having covered the seventeen miles from Albany in 46 minutes. Trailing behind, seven horse-drawn coaches arrive a half-hour later. The horse has met its first reverse.

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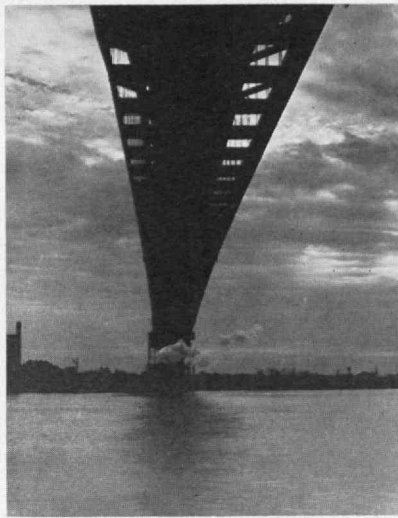
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# THE TECHNOLOGY REVIEW

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*Edited at the Massachusetts Institute of Technology*

VOLUME 35

NUMBER 2

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*Taken at Conowingo Dam by William R. Hase*

## SPENT WATERS

*While the ultimate amount of power in the world obtainable from water is small compared with that of coal, engineers have estimated that 240,000,000 horsepower of falling water remain to be harnessed.*

*If coal and water are ever spent, what next? Perhaps the answer will come from the laboratories of those chemists who are seeking ways to convert solar energy into useful electrical energy*

# THE TECHNOLOGY REVIEW

Vol. 35, No. 2



November, 1932

## Domestic Air Conditioning

*Made-to-Order, Year-Around Comfort for the Home*

BY WALTER L. FLEISHER

**T**HE art of air conditioning homes, apartments, and offices is now passing through much the same phase that radio did less than a decade ago—a period of premature exploitation and of half-baked designs on the part of some manufacturers and of naïveté and indiscriminate buying on the part of the public. Of the 98 air-conditioning devices now advertised, less than a dozen fulfill in any degree the requirements of the accredited definition of air conditioning, which is a *simultaneous control of temperature, humidity, and air movement*.

Armed with this definition, I wish to cut behind current ballyhoo and discuss with engineering objectivity the limitations, the advantages, the cost, and the promise of domestic air conditioning.

Let me point out in the beginning that any conditioning plant, to be successful, requires a properly operated and adequately insulated house. It will always be futile, with our present domestic habits, for the engineer to guarantee definite summer conditions. In the winter time, for example, cold drafts are so annoying that all parts of the house, doors, windows and cracks are kept as tightly closed as possible, because the failure to do so quickly effects the comfort of the occupant. In the summer, however, it is tremendously difficult to keep everything closed, and open doors and windows in relatively remote parts of the house are

**WHAT IS AIR CONDITIONING AND HOW IS IT ACHIEVED? WHAT ARE ITS LIMITATIONS, ITS COSTS, ITS FUTURE? A PIONEER CONDITIONING ENGINEER EXAMINES THESE QUESTIONS IN BEHALF OF THE HOME-OWNER**

unnoticed because they occasion very little obvious difference, although they disrupt the operation of a cooling system. The importance of insulation had never been duly recognized until several years ago when there was brought from England the “radiant” method of heating, which really is nothing

except a method of heating a large part of the internal exposed surfaces (walls or floors) of a structure to bring these areas up to a temperature approximating the desired temperature of the enclosure. This radiant method, which, in a simplified form, has been used abroad for years, has led to a very profitable study of radiation in this country. By radiation I mean the invisible rays sent out by a dark surface to an interposing surface. This investigation brought about the realization that the heating of a room or an enclosure was simply for the purpose of relieving the human being of the amount of work necessary to make up the heat radiated from his body to adjacent cooler surfaces.

In practically all of our uninsulated enclosures, the walls are considerably cooler than the air in the room and the body temperature or skin temperature of the occupants. According to the Stefan Boltzman Law, a person is continuously radiating heat to these cooler surfaces at a rate proportional to the difference of the fourth power of the absolute temperatures between his body and the radiating surface.





Keystone

### THE OLD

*The old stove with the kettle atop which warmed our forefathers. Compare it with the modern method of manufacturing weather shown on opposite page*

With the radiant heating system, practically all of these wall surfaces are heated, and in most cases, the heating surfaces are backed by insulating materials which prevent the leakage of this heat out of doors. This automatically provides the installation essential to *proper comfort* as distinguished from *proper heating* and makes one feel contented with a surprisingly lower temperature than is usually considered necessary by most Americans. In other words, the method of measuring temperature with the ordinary *dry bulb* thermometer is a very poor way of indexing comfort conditions. *Insulation is, therefore, one of the best means of obtaining winter comfort and the insulation of an enclosure will, in a reverse way, add tremendously to the usefulness of summer cooling.*

Since it is difficult to provide adequate insulation in houses already constructed, the effect that we can obtain from cooling systems in old buildings today will have to be that obtainable from air movement with dehumidified air. To obtain dehumidification the air has to be cold. *To maintain definite conditions in our present structures is a problem that very few air conditioning or cooling engineers would like to attempt within the limits of the average householder's pocketbook.*

Now, as to the question of health as a function of air conditioning, I feel that we know very little biologically about the relationship of health and comfort. Psychologically we feel better when we feel comfortable, but which of the comfort-creating conditions are essential to health, from a biological standpoint, has not been demonstrated. Whether moisture is essential in our houses in winter because our temperatures are too high is questionable. If conditions could be created by which we felt comfortable at lower temperatures, whether the addition of more moisture would be beneficial, is likewise questionable. Whether the circulation of air or whether a change in conditions is the essential point has never been satisfactorily answered.

It has always been my pet theory that monotony of conditions was one of the things which caused most people to complain of discomfort without knowing why. If we could subtly and irregularly vary our conditions from too cold to too hot and back again, we would

### THE TECHNOLOGY REVIEW

find the answer. Of course, to obtain this cycle requires all of the equipment necessary to fulfill the definition of air conditioning.

Today we are being regaled with the theory that comfort is a function of the ionic equilibrium or electrical condition of the air. We know that human beings absorb or remove or adsorb from the normal atmosphere negative or positive ions to create an ionic condition different from that existing before their occupancy. Whether the maintenance of proper ion counts in the air we breathe or the surroundings in which we live will make possible the elimination of other factors in air conditioning, still remains to be proved. We are well confirmed, however, in the fact that the introduction of a sufficient number of ions to build up the discrepancy between normal air and occupied air is simple, and that the comfort conditions with equilibrium re-established are not deleterious to the occupants.

**T**HEORETICALLY, a system for providing heating, humidifying, and air movement should have, when properly designed and installed, a first cost only 10% to 15% greater than our modern systems of heating. The addition of refrigeration should not add over 50% to this first cost. In other words, assuming that the present cost of heating a residence with, of course, an adequate system is \$1,200.00, the future system with humidification and air circulation should cost not over \$1,400.00 or \$1,500.00 and the refrigeration required to operate this in the summer time not over \$500.00 or \$600.00 more. I believe that this proportion can be carried out in the office building and apartment building in the same way.

As for operating expense, the cost of humidification could be offset by the lower dry bulb temperature required with humidified air. With one change of air per hour the amount of water which must be evaporated to make up for the deficiency in moisture of the entering air is equivalent to about 10% of the condensation required for heating. But, if the dry bulb temperature of the room can with comfort be kept two or three degrees lower than it can be kept without humidification, then the actual amount of steam necessary to be condensed approximately balances. The cost of humidification is, therefore, offset by the lower temperature it permits.

For summer cooling the average house requiring 600 sq. ft. of radiation (150,000 B.T.U. per hour) will require about five tons of refrigerating effect or the equivalent of 60,000 B.T.U. per hour. But in winter a temperature of 70° F. indoors has to be maintained against a temperature out of doors of possibly 10° F. or a differential of 60°. In summer if an inside temperature 10°, or at most 15°, lower than the outside temperature is maintained, adequate comfort is enjoyed. One would think, therefore, that the ratio of 60,000 to 150,000 is too high compared with the ratio of differential of temperature of 10 to 60, but in summer, the effect of the sun and the heat given off by the occupants is an added load for the conditioning system, whereas it is subtractable from the load in the winter. This is the reason for the difference in ratios that I have cited and an explanation of why cooling is more expensive than heating.



**WE NOW** come to the difficult problem of obtaining the refrigeration essential to maintain cool conditions in the summer. There are six ways of doing this:

1. *By water evaporation.* That is, the adiabatic evaporation of water to create cooling of the air. This is hardly reliable on humid days.

2. *By the ordinary compression or absorption system of cooling,* using an artificial refrigerant. As ammonia is not suitable for household use due to its toxic effect and to the restrictions of the various fire and health departments, such refrigerants as carbon dioxide, sometimes methyl chloride, or special refrigerants like the new *F 12*, usually in an electrically operated compression machine, must be used.

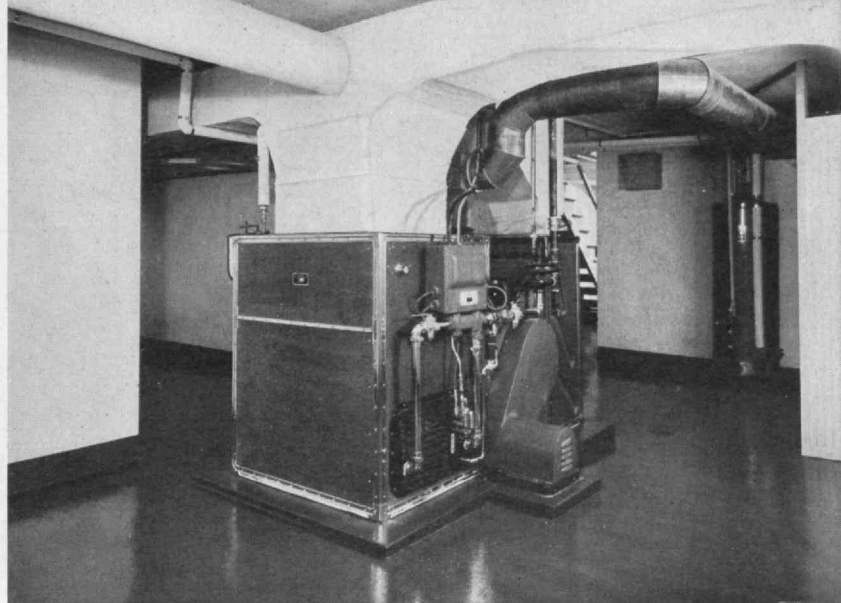
3. *By the use of surface or well water.* If this is obtainable in sufficient quantities it is usually cold enough to be satisfactory, particularly in household cooling. This water usually runs within 10° of the yearly average temperature of the locality. Unfortunately it is seldom obtainable in sufficient quantities to function properly in a cooling system.

4. *By the adsorption system of cooling.* This system, using silica gel, alumina, or calcium chloride (over which the air to be conditioned is passed), extracts moisture from the air to dehumidify it and incidentally to raise its dry bulb temperature. The dry bulb can then be reduced to a reasonable extent by means of surface contact with interchangers through which tap water runs. It can then be further cooled if desired, although the contention of the advocates of this type of system is that air so dehumidified, when cooled to the extent that tap water will cool it, gives conditions which are decidedly conducive to comfort.

5. *By utilizing the melting effect of ice.* This method has many advantages but probably more disadvantages. The equipment essential for its use is relatively inexpensive, and if adequate for the purpose, is large. Of course, it is simple to operate because all that is required is an ice container and water flowing over the ice, and then circulation of the cold water through the cooling surfaces. It requires no condenser water, which is a big factor in the general use of cooling, but ice itself is very much more expensive than the type of refrigeration which will eventually be used. Also it is difficult to handle because necessarily it must be handled in large quantities or stored on the premises or obtained on short notice from a central station.

At the present time \$4.00 a ton is about as cheap as ice can be obtained, and that means \$4.00 for 288,000 B.T.U. or one cent for 720 B.T.U. With many types of artificial refrigeration, exclusive of interest and depreciation on the equipment, but including those amortized parts not necessary with ice melting equipment, 2,400 B.T.U. can be obtained for one cent without great difficulty.

6. *By the use of steam.* The injection of steam into a thermo-compressor, or venturi tube, creates a vacuum on a flash chamber to give a boiling point of water of from 40° to 60°. No artificial refrigerant or colloidal or crystalline material is necessary. In my opinion this method has great possibilities for residential work where the capacity of the heating boiler is just about equal to producing sufficient refrigeration for summer use.



Courtesy of Carrier-Lyle Corp., Div. of Carrier Corp.

### THE NEW

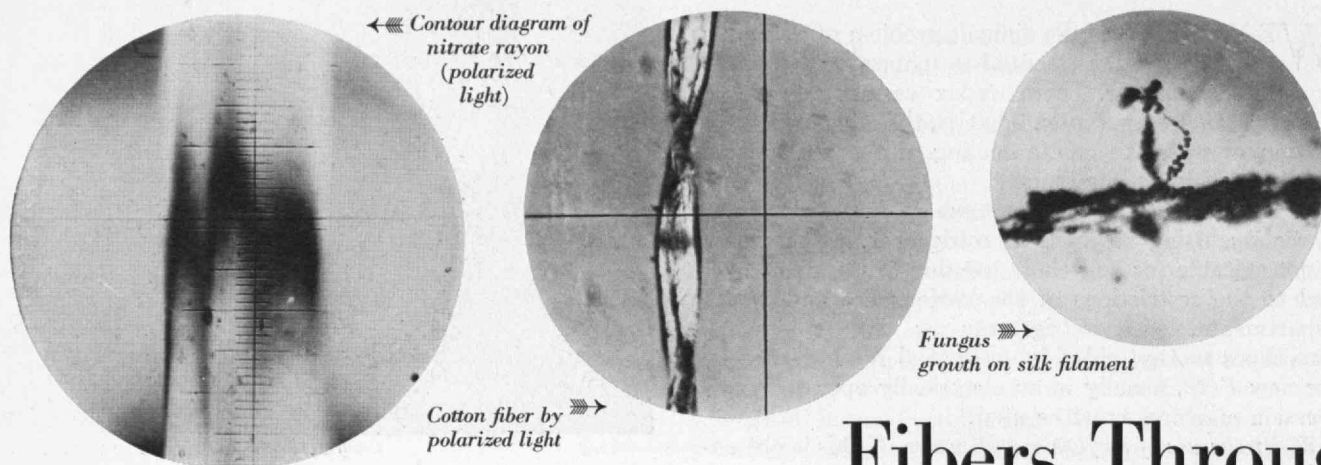
*Typical home installation of a "Weathermaker" for producing simultaneous and automatic control of temperature, humidity, and air movement*

The same boiler that generates the steam for winter heating and humidifying can, by this method, develop the refrigeration for summer cooling. This method has the advantage of not requiring the layman to understand the handling of refrigerants or moving machines, or to exercise any of the safety requirements essential with artificial refrigerants.

With artificial refrigeration about one and a half to two horse power per ton of refrigeration is required which, at the price charged by local utilities, makes a rather high cost of operation for the householder. At four cents a kilowatt hour this would be 10¢ per hour for the compression machine alone, or about \$1.25 a day. To this, of course, would have to be added the cost of power for motors to drive the fan and circulate the cooling medium. This might add another horse power, or in terms of expense, another dollar. To this would have to be added the condenser water which would run at least two gallons per ton per minute, or 120 gallons an hour, and if cooling towers were not used, this might amount to another dollar a day. But, as maximum conditions would not have to be maintained over the full month, we can say that from \$50.00 to \$75.00 a month would be the cost of cooling with artificial refrigerants.

Using ice as a refrigerant in the average household, we might assume that during the worst months at least 25 tons a month would be required, costing \$100.00. Undoubtedly, the average householder, even though he had an ice cooling equipment, would never use this much ice, but would be content to be uncomfortable rather than make this expenditure.

If a steam ejector type of refrigeration were used, it would probably require 50 pounds of steam per ton per hour, or a total of 250 pounds of steam per hour. With a high efficiency gas or oil burning boiler, 250 pounds of steam could be developed for 9¢ an hour using oil and for 6¼¢ using natural gas of 1,000 B.T.U. value, selling for 25¢ a thousand cubic feet. To both the oil and gas systems the same motive power for circulating the refrigerant and blowing the air would have to be applied, so that any one of these systems would have to be recognized as costing approximately \$50.00 a month to operate. Therefore, except in (Concluded on page 66)



# Fibers Through

## The Microscope Shows the

By E. R.

With Photomicrographs

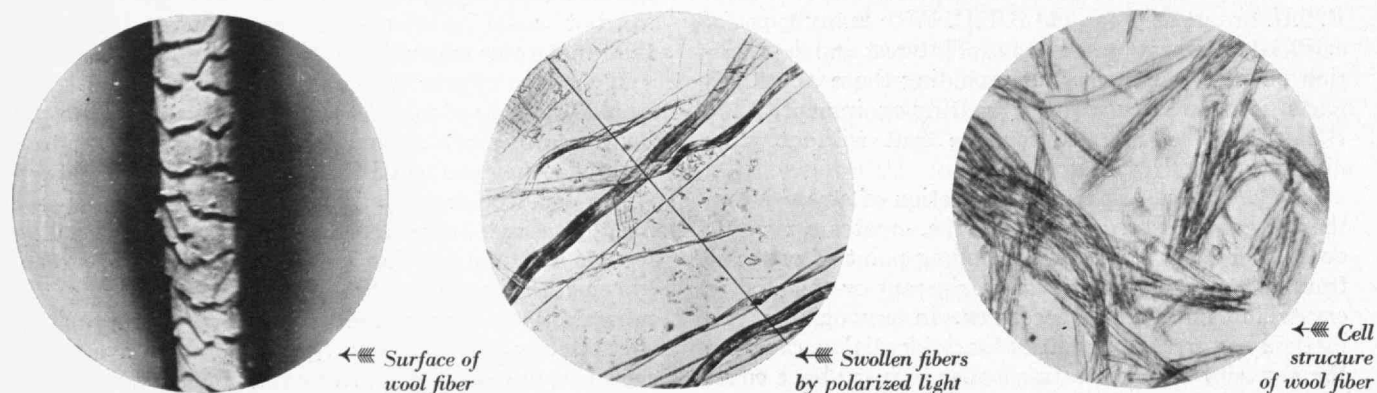
THE textile manufacturer is a giant when he handles tons of raw fibers, when millions of bales of cotton are processed and converted into billions of yards of marvelously fashioned fabrics. But the textile technologist is the smallest of dwarfs when he penetrates into the world within the fiber itself and strolls about among the cells — yes, even the atoms and molecules of its structure. Modern scientific research makes this possible at last, if vicariously. The observer who watches in amazement while a mass of viscous, molasses-like syrup is converted before his eyes into shining skeins of snow-white rayon yarn, has still to see the most amazing thing connected with this art.

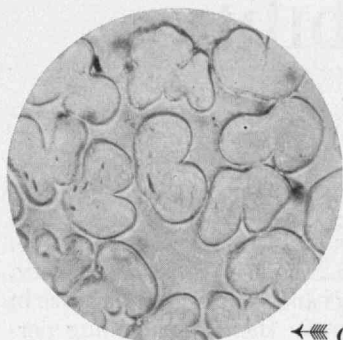
The textile technologist who works with a microscope is the midget. He thinks nothing of taking a single filament of cobweb fineness — so fine as to be scarcely visible to the naked eye — and cutting it into a series of thin slices. Each slice is no wider than a piece of tissue paper is thick, and is so thin that 100 of them piled one on top of another would make a pile the thickness of which would be only one-fifth that of your little finger nail. Nor is the textile microscopist content with this seeming miracle. He no sooner has them cut than he proceeds to cement them onto the surface of a glass slip so that he can study them under his microscope. And, believe it or not, his cement is hard-boiled egg!

Nor is the microscopist at all deterred by the fact that the component parts of certain fibers, notably wool, are so closely similar in constitution and are so closely packed together, that even the most powerful microscope fails utterly to reveal them. What the optical

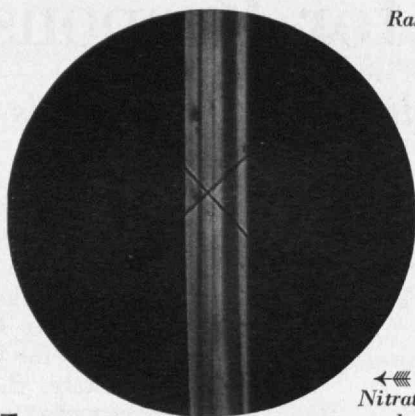
system cannot show is so swelled and separated by the action of some chemical that its nature can be made evident (third picture from left below). Where such methods are not to be desired, and where the mysteries of nature baffle by their very consistency, the scientist calls in an army of trained light waves. Although no certain knowledge of the privates in the ranks is yet available, our research worker marshals them in orderly array and sounds the attack. Many are lost in the battle as they traverse the No-Man's Land of the spiral fibrillae in a single fiber of flax, so small in itself as to require a magnifying glass to find. In spite of the casualties, some of the companies survive and return in sufficiently good order to tell of their experiences. Unfortunately, their communications are too often in code. Until the messages can be more fully decoded than at present, we still grope for the reason why the structure of flax is *always* spiral and of a given hand, while that of hemp is *always* opposite.

In other applications our trained light waves can be so well disciplined not only in close order drill, but in mathematics, that they will plot for us a diagram to exact scale right on the fiber itself to show the contours of the surface (photomicrograph above on left).

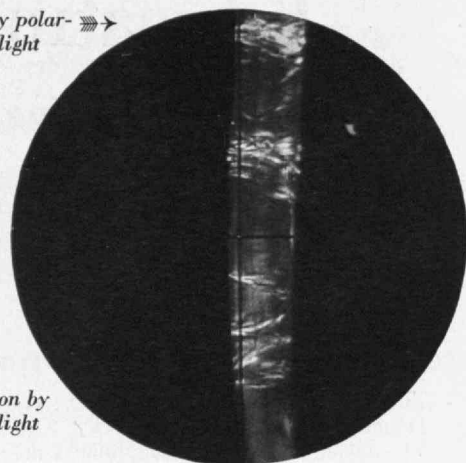




← Cross sections of acetate rayon



Ramie by polarized light →



← Nitrate rayon by polarized light

# the Object-Glass

## Way to Better Textiles

SCHWARZ

by the Author

Just as the aerial photographer can make stereoscopic maps of the earth's surface, so the textile technologist, peering through his polarizing microscope, sees the ridges and valleys as they lie extended before him on a filament from Miss Fifth Avenue's gossamer hose.

We speak popularly of the myriad colors of the spectrum, evidenced by the modern articles of outer-wear and under-wear which fill our stores. When they chance to be of viscose rayon, the metaphor is even better than we are aware. Each fiber may actually be a miniature diffraction grating, engraved with literally thousands of ridges per inch and each producing its own diffraction effects. Without comprehending all that he is doing, the mill man varies these in shape and spacing or eliminates them entirely.

That this should be possible is fortunate, for the human is a peculiar animal. He is easily satisfied and, at the same time, never suited. The same rayon which today, because of its smooth surface, gives high luster and consequently meets with Dame Fashion's approval, must tomorrow be broken with mountain ridge and river valley to give that ultra-modern touch of dullness. A few hundred mountains more or less in a rayon range make all the difference in its world and ours.

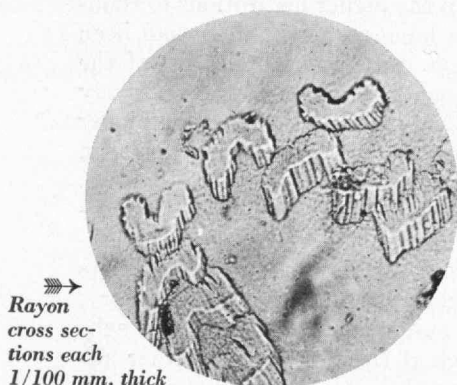
Great indeed must be the faith of the technician who not only removes mountains, but restores them!

No metamorphosis of squirming grub to gorgeous butterfly bears with it any more of wonder or of romance than does the synthesis from black tar of the brilliant hues wrought by the organic chemist. Far more reasonable is it for the metallurgist to add a trace of chrome or cobalt to a bar of steel and thus to change its physical properties than for the textile manufacturer to seize water vapor from the air to mingle with the cellulose of the fiber and so increase the fabric strength by half. Yet air conditioning for the purpose of maintaining proper moisture conditions in the textile material throughout its manufacture and test is a vital necessity.

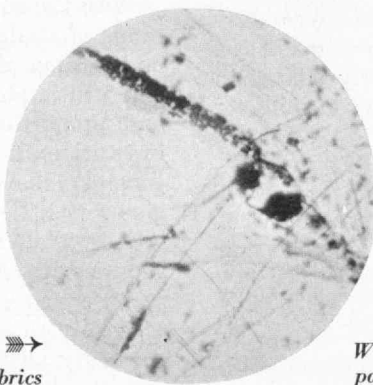
For years man has fabricated machines, erected buildings, and spanned mighty rivers with the aid of steel. He is only now beginning to find out what steel can be and do.

For centuries man has spun yarn and woven fabrics, but he still knows little of the strength and structure of the fibers he employs. Here again he is commencing a study of the fundamentals of his craft.

And yet, with all his striving, man — scientist though he be — is bettered by the lowly worm and by the humble sheep. He fights a desperate battle against the beetle and the bug; the weevil and the moth, the fungus and the germ. And all this that we may be arrayed as the lilies of the field; that we may be served by fabrics from the road beneath our feet to the airplane above our heads, the while our thread of destiny is spun and the loom of time weaves on.



→ Rayon cross sections each 1/100 mm. thick



→ Mold on rayon fabrics



→ Wool fiber partly disintegrated



# Educating for Responsibility

## *Adapting Engineering Education to the Needs of the Individual*

BY RICHARD H. FRAZIER

A certain type of college grad  
Always makes me deeply sad.  
Refined and fluent, nicely bred,  
The gentleman from heels to head,  
Urbane and bookish, rarely dull,  
He still remains superbly null.  
The apparatus of intellect  
Is well installed, as you'd expect:  
The delicate wheels go buzz, buzz, buzz —  
But does he think? He never does!

I vote for roughnecks and sea cap'ns  
In whose minds, often, SOMETHING HAPPENS!  
— CHRISTOPHER MORLEY<sup>1</sup>

VERY early in the development of the United States there arose a sincere desire to provide equal educational opportunities for all, a very commendable desire, and one which has been carried out with vigor and with credit to the nation. It is a debatable question, however, whether or not in the field of higher education, and to a certain extent in the field of secondary education, this democratic ideal has been carried too far and the process has become insufficiently selective; whether or not the projection of mass education into the later years under the assumption that all who apply are entitled to substantially the same educational treatment has carried along a goodly number farther than is justifiable either economically or educationally, and at the same time placed the general level at such a point that many of the more brilliant and ambitious have been needlessly held back, to the detriment of both groups.

A few comparisons<sup>2</sup> with conditions in leading European countries are of interest because of the light they throw on these questions. In England, Germany, and the United States, practically all the children attend school till the age of 14 years. But, after the age of 14 years, about 88%<sup>3</sup> of the English children and about 92% of the German children receive no further schooling other than in the trades. In other words only about 12% of the English children and 8% of the German children continue to what corresponds approximately to the secondary schools in this country. In the United States, however, about 55% of the children continue to secondary schools, leaving only about 45% who stop school at the age of 14 years, or receive thereafter only education in the trades or in business by attending evening or correspondence schools.

<sup>1</sup> *Parson's Pleasure* (George H. Doran Co.).

<sup>2</sup> The statistics which follow, except as noted, are taken from "The Quality of Educational Process in the United States" by W. S. Learned, Bulletin No. 20 of the Carnegie Foundation for the Advancement of Teaching, 1927. Since the figures are based on various census reports prior to 1927, they do not represent the exact present-day proportions, though the change probably is not great. Most of the figures for Germany relate particularly to Prussia.

<sup>3</sup> Estimated from data in "The English Tradition of Education" by Cyril Norwood, page 171.

In England, for the ages of 15 to 18 years inclusive, which corresponds to high school age in this country, only about 6.9% of the boys and 7.5% of the girls are in full-time schools. In Germany the corresponding percentages are 5.4 for boys and 3.4 for girls, while in the United States the corresponding percentages are 32.6 for boys and 37.4 for girls.

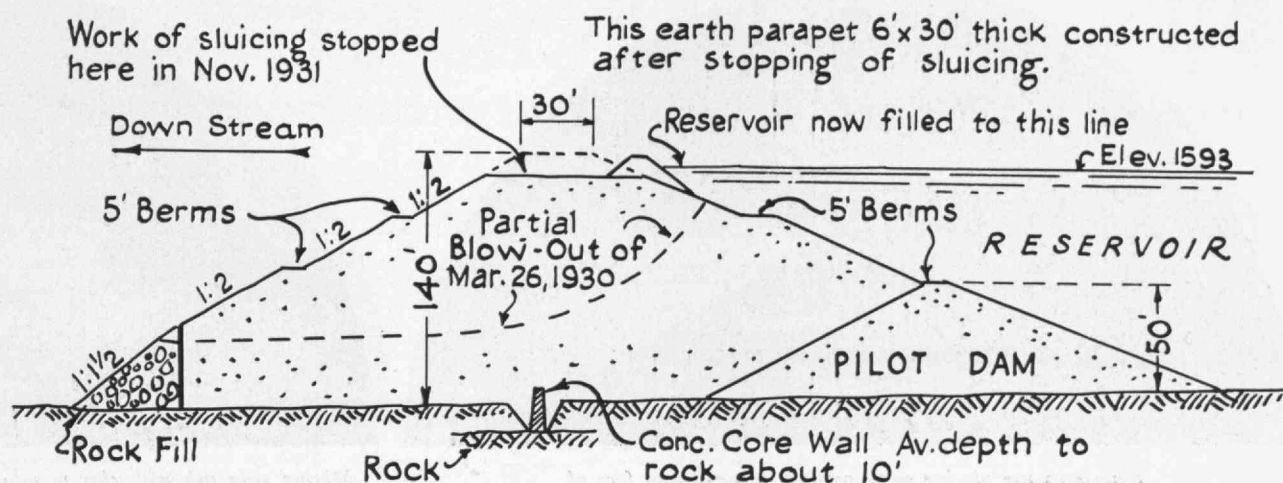
The situation in higher education is indicated by the following table for the ages of 20 to 24 years inclusive:

	Men	Women	Total
France . . . . .	3%	0.6%	1.7%
Germany . . . . .	3.2	0.5	1.9
Great Britain . . . . .	2.3	0.9	1.5
United States (whites) . . . . .	10.4	8.1	9.2

In other words, the United States has about three to four times as great a proportion of its men, and about nine to 16 times as great a proportion of its women in institutions of higher education as other leading countries of the world. If the figures included the age of 19 years, the comparison probably would be heightened.

There are few who would maintain, however, that these same ratios hold with regard to the accomplishments of the graduates of higher institutions in the various countries. The great influx to the higher institutions in the United States is a comparatively recent phenomenon. Throughout the pioneering period of this country's history the college and university graduates were not a very important influence except in a few professions. In order to be eligible for public office it seemed necessary for the candidate to arrange to be born of low degree, to demonstrate that he had experienced the rigors of hard physical labor, and that his formal education had been meager. In the world of business the man of education was equally suspect. The self-made man was glorified. But more recently this antipathy toward the more highly educated (which has not been totally devoid of sound foundation) fortunately has died out markedly, especially with respect to engineering school graduates, reasons for which will be touched upon later.

With the coming into the higher institutions of thousands of students from homes wherein there had been no tradition of education, came a misapplication of the democratic ideal of equality. In spite of the relatively high proportion of students who continue to the higher institutions in this country, the secondary schools, in general subscribing to this pseudo-democratic ideal, give very little, if any, special attention to the more ambitious, while in the other countries mentioned the universities are the very foci of the respective systems. As a consequence, the higher institutions in this country, especially those under public control, must admit substantially all who knock at their doors and either adjust the level of instruction (*Continued on page 67*)



TYPICAL CROSS SECTION OF THE ALEXANDER DAM

Scale: 1 in = 100 ft.

# The Alexander Dam in Hawaii

## *How Soil Mechanics Was Used in Building a Great Earth Dam*

BY JOEL B. COX

AN ACCOUNT of the Alexander Dam, which has recently been completed on the Island of Kauai, the most northerly of the Hawaiian group, is of interest to engineers from two points of view. On the one hand it presents the story of the building of a great earth dam in the face of considerable difficulties and on the other of a development of the science of soil mechanics and of its application to the art of earth dam building.

The dam creates a reservoir providing storage to meet power and irrigation needs. It is a structure with a central height of 140 feet, crest length of 620 feet and a volume of 540,000 cu. yds. Foundation conditions, especially in the abutments, and materials available both necessitated an earth dam. From the beginning it was realized that difficult problems were presented in the utilization of the only material available. This is an exceptionally fine grained laterite, the result of the very thorough decomposition of basaltic lava and ash, largely the latter. The material is easy to excavate and place, but extremely slippery and dangerous. This was known and, following engineering thought then current, trouble was anticipated in slow consolidation of the core.

The decision to use hydraulic fill construction rather than rolled fill was based on unsatisfactory experience with other rolled fill dams in Hawaii. An essential difference between the rolled fill and the hydraulic fill lies in the fact that the danger of failure in the case of the hydraulic fill is a construction hazard only. After it is built its strength increases while the stresses continually decrease. It has been tested during construction far beyond any load to which it is subjected during service.

The rolled-fill dam, on the contrary, can develop trouble at any time after completion and the hazard with highly elastic difficult soils such as those available is great. The dangers and difficulties increase under high heads.

The work of Dr. Charles Terzaghi, then of the M. I. T., had brought the science of soil mechanics to a point where it would definitely bear on the problem of core consolidation, and the services of the Hawaiian Sugar Planters Association Experiment Station were secured to investigate this problem. Dr. F. E. Hance undertook this work and his results indicated that the core would consolidate with sufficient rapidity. Construction was thereupon prosecuted with confidence.

A pilot dam, only 50 feet high and now swallowed up in the main structure, was first built and so located that its up-stream face would lie in the same plane with the up-stream face of the main dam. Its base was only 250 feet thick as against 680 feet for the completed structure. It lay entirely up-stream from the location of the masonry corewall. The impounding basin formed by the pilot dam provided the hydroelectric power for carrying on all subsequent sluicing operations. The little dam built the big one—a sort of process of lifting oneself by one's own boot straps. This method of construction was not so much unique as it was economical. Only nine men per shift were used in handling the removal and placement of the half million cubic yards of soil.

On March 26, 1930, a blow-out came low down on the lower bank of the dam, occurring first over a limited area but by gradual collapse undermining a channel through the downstream beach and resulting in the destructive



*Flumes in use placing earth parapet on up-stream face of Alexander Dam*



*Mixing soda ash with clay to secure impermeable bond*

release of the core pool and the movement out of some 250,000 cu. yds. of earth. What was wrong? It was *not* the consolidation of the core, which had actually done somewhat better than had been computed. Parts of it stayed in the dam. None of the lower 40 feet moved at all.

What had happened? As clues there were the accounts of eye witnesses, the conditions immediately after the break, and the materials involved which could be put in the laboratory and tested. It is too long a detective story to tell in detail, but it may be sketched briefly. The failure was originally in a small zone about 30 feet from the base of the dam (on the down-stream side) and near one end. The material (supposedly coarse and well-drained according to the theories of hydraulic-fill dam behavior) had shot, like the cork out of a champagne bottle, out of this little hole, across a 500-ft. gulch, and splashed 60 feet up the opposite side. All this happened *with no disturbance of the core*. Not until this hole had formed, and the adjacent sections of the down-stream bank caved into it did the core begin to move, and then it started to overflow at the top! It was the laboratory that supplied the answer. The cause was a local compacting in the down-stream beach (the cork of the champagne bottle) due to insufficient strength under compressive forces of the lumps composing this section of the dam. The compressive forces were, of course, the load caused by 70 feet of earth. When these lumps crushed they formed a mass which our laboratory found was even more impervious than the core itself. Behind this cork had accumulated the outward drainage of the dam until it shot out under the accumulated pressure.

A study of the failure and its causes and the available means of remedy resulted in a decision to rebuild along substantially the same lines as the original construction but overcoming by the following methods the intrinsic difficulties of the poor beach material available:

- (1) the maximum feasible increase in beach section,
- (2) the building of a rockfill toe 40 feet in height,
- (3) artificial drainage of the down-stream beach area by the use of tile drains and rock-filled trenches. This drainage was provided not only at the base of the dam but at five additional levels above this, while one drainage level was provided in the up-stream beach above the crest of the 50-foot pilot dam.

Immediately following the collapse, the loosened material within the dam cross-section was removed by jetting, the pumping plant being floated on the reservoir surface.

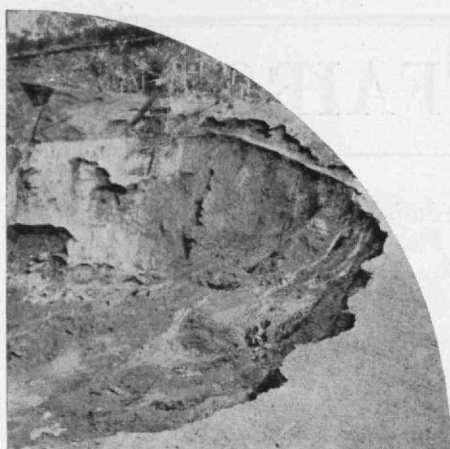
On November 23, 1931, the top of the dam core reached an elevation of 1,593 feet, or 12 feet below the designed height of dam, heavy and continuous rains during the last five months of the sluicing period having delayed the work materially. At this point the methods of stress-computation employed (which were based on careful laboratory tests of the materials actually used), indicated that the total outward core pressure bore the same relationship to the shear resistance of the beach (determined by laboratory tests under identical conditions) as prevailed at the time of the March, 1930, collapse. While it was recognized that the tile drainage, which was still functioning well, removed the greatest menace to the stability of the dam, no means were at hand for accurately determining the magnitude of this safety factor, and it was decided that a proper conservatism dictated a delay in the addition of this top 12 feet. Accordingly, core sluicing was discontinued, an earth parapet six feet high and 30 feet thick at the base was constructed on the up-stream beach of the dam, and the south spillway cut down to permit temporary operation of the dam at this height.

It is planned to add the additional 12 feet of height late in 1932 when the core pressure, as reduced by compacting and draining, will not exceed that at 1,593 feet elevation in November, 1931.

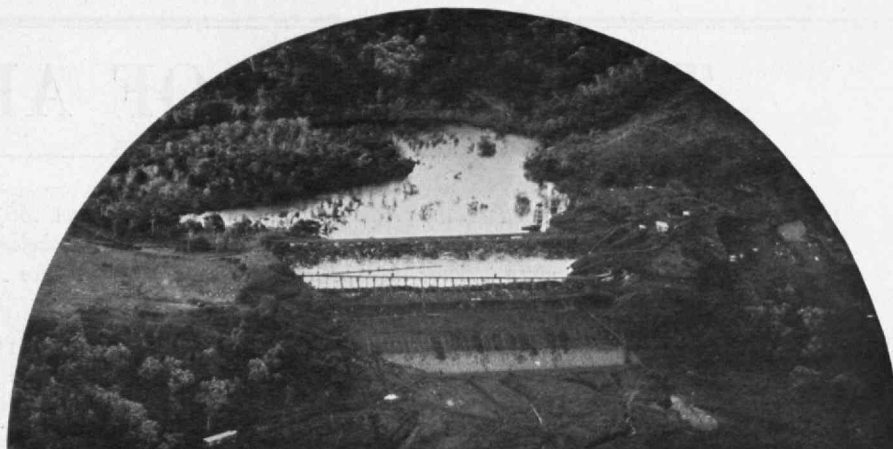
Thus the dam was successfully put in service. Its subsequent record can almost be described as dramatic. In February, 1932, 50.30 inches of rain fell on the watershed. There was enough water to fill the 800 million gallon reservoir four times over in one month. On February 12 the heaviest day's run off occurred. The maximum discharge on this day was 12,700 second-feet from a drainage area of 2.35 square miles, an amount equivalent to a run off of over 8 inches per hour. This record-breaking flood was routed through the reservoir, spillway, and outlets without difficulty.

**WE NEXT** turn to the story of how the science of soil mechanics was necessary to the successful completion of the dam and of how our concepts of this





*The blow-out which occurred on the lower bank of the dam*



*Air view of the dam and reservoir as the latter was nearing completion*

science had to be developed in order to make it adequate to the task.

Despite the fact that earthwork is one of the oldest forms of construction that may properly be called engineering and that earth problems in foundations or otherwise obtrude themselves in nearly every problem of construction, we have less adequate knowledge of this material than of almost any other with which the engineer has to deal. Until recently all our design has been based on purely empirical experience with completed structures. Analysis and detailed stress determination have not played a very creditable part.

Theoretical analysis of soil stresses has in the past been made by means of assumptions much simpler than the actual nature of the material. The early work of Rankin and Coulomb, and the designs of retaining walls based thereon, assumed earth to be a granular, non-cohesive material with a definite "angle of repose." Later Fellenius and others developed more satisfactory formulae from a consideration of cohesion as well as friction, and the use of curved surfaces of movement.

The greatest contribution has come from Dr. Karl Terzaghi, who recognized that soil is far more complex than these early theories assumed, and that progress could be made by considering soils as a complex of elastic grains of solid material with the interstices filled with water. The pointing out of the enormous influence of the surface tension of the water between the grains of soil at an air-and-water interface was a great step.

Other phenomena of great importance in the actual behavior of soils under stress arise from the inclusion of air in various states in the mass, and in the results of base replacement and colloidal effects due to absorption and the change in physical character coincident with a change in the acidity of the soil.

In many such relationships the mineralogy of the soil, — the actual chemical composition of the various individual grains — is of the utmost importance. Much progress in the understanding of soil phenomena may be expected along these lines.

A most important discovery was made by Dr. Hance at the H. S. P. A. Experiment Station. Terzaghi thought of soil as composed of definite, unchanging elastic grains. Hance found that when certain chemicals were present

in either water or soil and were altered in amount, changes in the relationship between the soil grains and the water took place thereby vastly altering such physical facts as elasticity and permeability.

It was found that the soils used were characterized by several extraordinary qualities: (1) the ability to hold against pressures equal to well over 100 feet of soil, a volume of water twice as great as that of the soil itself; (2) the extraordinary range of specific gravity of the soil particles themselves *in every sample* — from 2.2 to 5.2.

An important development was the existence and meaning of a wide difference (in certain soils) between the sizes of grain as measured by the usual methods of sedimentation and of the actual diameters of the same grains when carefully measured by the microscope. This difference is an index of the shape of the grains, of the existence of expanded or hydrated particles, and of similar facts of significance. Perhaps most important of all was the work done on the relationship between moisture content, pressure, shearing strength, and lateral pressure of cohesive soils. It has been shown that there is for such soils an optimum moisture content, both above and below which the cohesion is decreased, and we measured the influence of time and pressure of packing on the cohesion developed.

Finally out of the considerations of soil mechanics which we thus evolved and based on Terzaghi's fundamental work was developed the theory of analysis and design which has been carefully checked against every observable feature of the completed dam and which will probably be the most important contribution of these studies to engineering science.

It is obvious that the goal is to provide sufficiently complete and reliable measurements and computations to serve as a basis for design and control of construction, and this has been done in such a way as to check well with experience on the Alexander, Germantown, Calvaras, and other dams — all those on which comparable data are now available. Further research, it is believed, will add corrections and refinements to this theory rather than replace it. The use of mathematical and logical methods of analysis and design is not only of great direct importance but (*Concluded on page 74*)

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# THE TREND OF AFFAIRS

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IN THIS SECTION: *The Technological Drive in the Middle East* (56); *Stainless Selenium Steel* (58); *Super-Speed, Stop-Motion Photography* (58); *Powder that Is Smokeless, Flashless, Cool, and Indifferent to Moisture* (60); *Modern Trends in Mathematics* (62); *New Uses for Asbestos* (74)

## *Engineering in the Middle East*

ENGINEERING developments of such magnitude are underway in the Middle East that it is becoming necessary to reëvaluate the present-day commercial importance of the countries there and to assign to them a significance beyond their Biblical and historical background. The extent and character of this latest technological drive is indicated by the following list of current projects:

1. The highly publicized Turkestan-Siberian Railway.
2. The expanding scheme for supplying all of Palestine with electricity generated in the valley of the River Jordan.
3. The 460-mile Caspian Sea-Orsk pipe line building over the steppe of Kazakstan from the Emba fields, which are annually producing over two and a quarter million barrels of crude.
4. The continual pushing forward of the northern and southern rail heads of the Trans-Persian Railway.
5. An actual start on a joint undertaking, in which three nations and seven great petroleum companies are participants, to make oil from the Kingdom of 'Iraq, the ancient lands in the Tigris-Euphrates valleys, available at tidewater on the Mediterranean alongside one of the world's busiest trade routes.

It is the latter two, however, which are our immediate concern. To find a parallel for them we must turn back some 30 years to 1899 when permission to extend the Anatolian Railway via Bagdad to the Persian Gulf was wrested from a reluctant Turkish Sultan, and to May of 1901 when one William Knox D'Arcy obtained from the Shah the exclusive right to drill for, produce, pipe, and carry away natural gas, petroleum, and asphalt throughout five-sixths of the Persian empire. As is well known, in the "Bagdad Railway" (although even today it is uncompleted) lay some of the deeper roots of the Great War. Nor was the D'Arcy concession, which embraced rights over a territory twice the size of Texas, unconnected with that conflict, for from it grew the Anglo-Persian Oil Company, Ltd. It was because of a reliance on this Persian oil that the British Admiralty proceeded confidently with the building of the 25-knot *Queen Elizabeth*, whose 15-inch ordnance saved the day at Jutland.

A route for the building of a north and south railway across Persia, in length between 700 and

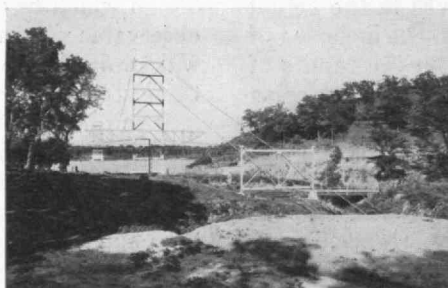
800 miles, was surveyed in 1926, and approximately 260 miles of trackage have now been completed. (See map page 57.) Persia is mostly an arid table-land encircled, except on the east, by mountains. Those in the north, the Elburz range, which the railway surmounts, rise to nearly 19,000 feet and are comparable in the construction problems they present with the Rockies or the Alps. Here, in a country with an area four times that of California, lives a total population about equal to that of Pennsylvania, which makes for a density about half as great as that of Minnesota. Persia has but one navigable river, the Karun, and her existing railway mileage, including the completed portion of the new line, is hardly more than that of Rhode Island. It is, therefore, not hard to understand that the Trans-Persian Railway, by displacing the present and uncertain methods of caravan transport, will inevitably exert a profound influence upon the future development of Persia.

The southern end of the line between Ahwaz, capital of Khuzistan, and the new port of Bandar Shapur crosses the 145-mile pipe line of the Anglo-Persian Oil Company, from its main producing fields at Majid-i-Sulaiman to the refinery at Abadan. The output from Majid-i-Sulaiman makes Persia fifth among world oil-producing countries today, outranked only by the United States, Russia, Venezuela, and Roumania, respectively.

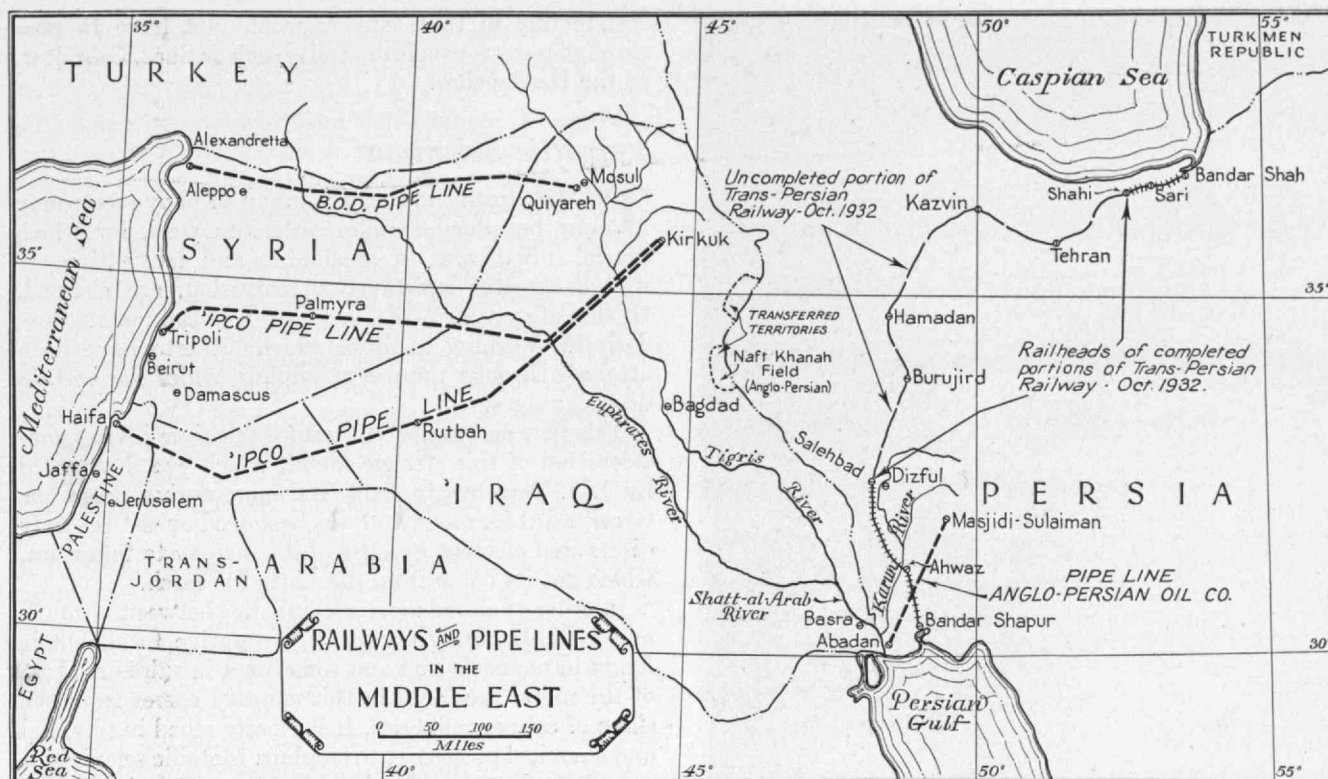
Scarcely had the D'Arcy concession been granted than he and his associates began negotiations to explore the petroleum possibilities of Upper Mesopotamia, or 'Iraq, where, since ancient times, the presence of oil and natural gas was known. The unconcern of the Turks for an administratively neglected province, plus the confusion of the interests due to the conflicting ambitions of several European nations, impeded progress up to 1914. Then the war supervened, 'Iraq was freed from Turkish rule

by Anglo-Indian and British Dominion troops, and her administration entrusted to Great Britain by the Supreme Council of the Allies. At first a mandated territory, she was by several treaties transformed into a constitutional monarchy which, only last month, attained sovereign statehood and membership in the League of Nations.

By an agreement signed in March, 1925, the 'Iraq government conceded the rights of exploration for 75 years over 32,000 sq. mi. east of the Tigris (except for a small



*The largest single-span pipe-line suspension bridge. It was built across the Missouri River by the Northern Gas and Pipe Line Company, has a clear span between towers of 1,280 feet, and supports a 16-inch line*



area known as the Transferred Territories, including the Naft Khanah field operated by Khanaqin Oil Co., a subsidiary of Anglo-Persian) to the Turkish Petroleum Co., the name of which was changed in June, 1929, to the more appropriate one of 'Iraq Petroleum Co. 'IpcO is an international affair and 95% of it is owned in four equal parts by: 1. Anglo-Saxon Petroleum Co., a subsidiary of Royal Dutch-Shell; 2. D'Arcy Exploration Co., owned by Anglo-Persian, in which the British government holds a 50% interest and in which Burmah Oil Co. is also a large stockholder; 3. *Compagnie Française des Petroles*, which represents a consortium of French industrial and financial interests in which the French government participates; 4. Near East Development Corporation, an American group including Gulf, Socony, and S. O. of N. J.

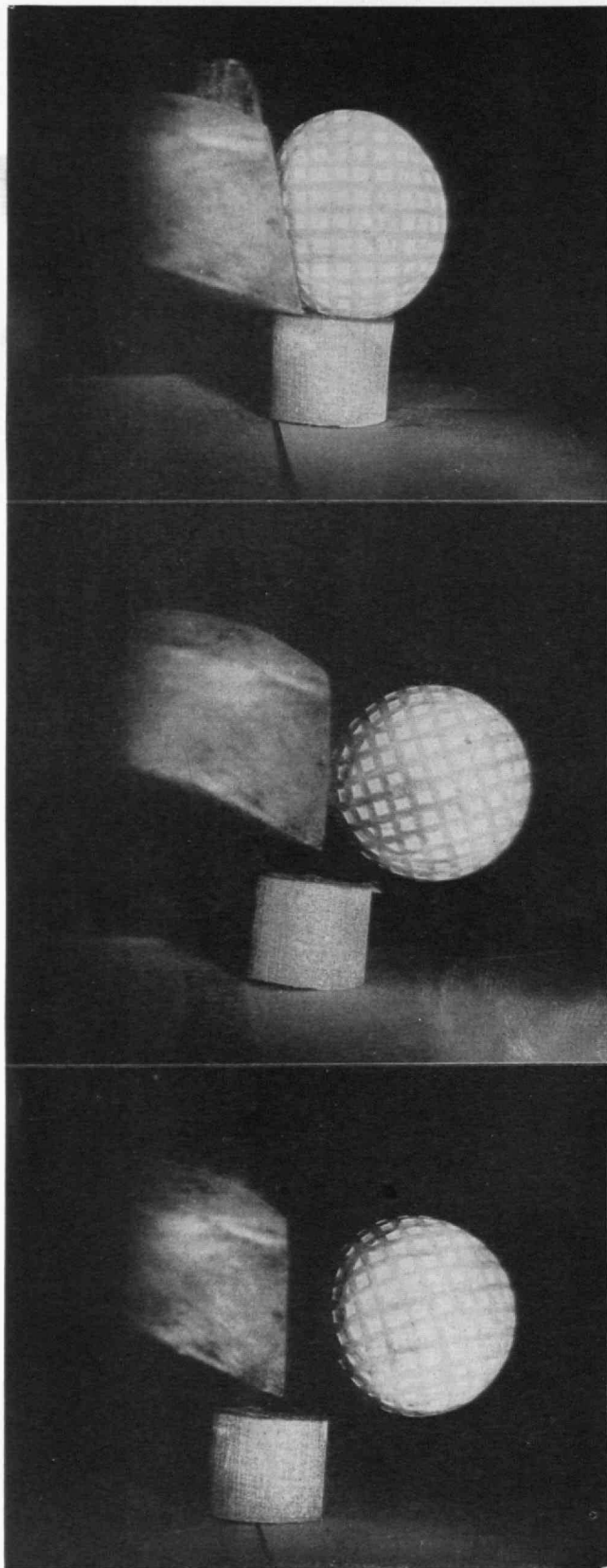
'IpcO began drilling in April, 1927, near Kirkuk and on October 14 struck the Baba Gurgur gusher. It flowed 60,000 bbls. a day until shut in, and of a total of 31 wells drilled up to now, all but two have yielded over 1,000 bbls. a day. It is from Kirkuk that 'IpcO will lay its pipe lines to the Mediterranean, first a line of 618 miles via Rutbah to Haifa, and later a line of 431 miles to Tripoli. The placing of pipe in position at river crossings began last September and main line work will start early in 1933. To install some 120,000 tons of pipe under the surface of desert wastes, having sparse population and no roads or railways, is in many respects the world's present most ambitious and unusual engineering project. It may be likened to the pioneering of western railroad building in Canada and the United States for, besides the new engineering problems involved, the pipe line crews face ever-present hazards of attack by marauding tribesmen. By the terms of its agreement 'IpcO must complete one line to the sea by December, 1935.

In May of this year the 'Iraq government ratified another concession to the British Oil Development Company, Ltd., also to run 75 years, and to cover 40,000 sq. mi. west of the Tigris. Although corporeally a British company, B. O. D. is, like 'IpcO, really an international affair though composed of different and entirely independent groups, including Italian, French, and German interests. B. O. D. is given seven years to survey and select areas for drilling but comes immediately into possession of the already proven wells at Quiyareh, near Mosul. B. O. D.'s projected pipe line will probably be about 500 miles in length from Quiyareh to Alexandretta, passing near Aleppo. Such a route would follow in general that of the "Bagdad Railway" and pipe could be laid above ground, both of which factors would ease its construction problems.

So far as the possible upsetting effect of introducing 'Iraq's oil to world markets is concerned, the issue does not have to be faced before 1936 when the first 'IpcO pipe line via Rutbah is ready. The minimum annual capacity of this line is to be 3,000,000 tons (about 22,500,000 bbls.). B. O. D.'s contract calls for a line shipping a minimum of 1,000,000 tons. In comparison, U. S. oil production in 1931 was over 120,000,000 tons, Russia's was over 22,000,000, and Venezuela's over 17,000,000.

Although distance is not a prevailing factor where sea shipments of oil are concerned, Haifa and Tripoli are approximately 2,400 miles from European markets such as London, while to London from Los Angeles is 7,700, from Galveston nearly 5,000, from Maracaibo over 4,000, and from Singapore over 8,000. For Mediterranean countries, however, 'Iraq oil will be not only nearby but will have a very definite advantage (a particularly strong argument from a military or naval





What happens when a golf club meets the ball! The top photograph of this series, made at exposures of  $1/50,000$  of a second, shows the ball flattened by the impact of a light stroke. The reaction from the impact is revealed in the middle picture in which the ball is elongated horizontally. In the bottom photograph the ball has started on its flight. Note the bulge on the right side, showing that it is still oscillating from the impact of the club

standpoint) in that tankers would not have to pass through narrow canals or straits such as Suez, Gibraltar, or the Dardanelles.

### *Versatile Selenium*

TO the already impressive group of alloy steels may now be added stainless selenium steel, for which special advantages in machining and fabricating, as well as greater resistance to corrosion, are claimed. In this alloy 0.25% of selenium gives the metal those desirable working qualities which hitherto have been attained through the use of sulphur, which has certain disadvantages.

This new and important use for selenium invites consideration of this strange metal, which was discovered by J. J. Berzelius in 1814. Its name derives from the Greek word for moon and was bestowed upon the newly discovered element because of its analogy to tellurium, which got its name from the Latin for earth.

In order of abundance, selenium lies between bismuth and gold. It rarely occurs in the native form, but is found in meteoric iron and sometimes in sulphur. Most of the metal produced in this country comes from the slime of copper refineries. It is closely allied in physical and chemical properties to sulphur. Metallic selenium is a poor conductor in the dark, but its ability to conduct electricity rapidly increases with the intensity of the light falling upon it. This characteristic has given it many uses in science and industry, and resulted in the light-sensitive selenium and silver selenide cells.

The metal, which has a pink tinge in certain forms, has long been used to counteract the green color caused by iron in the manufacture of glass. Certain quantities of selenium are also used to produce the rich red glass for danger signals. In ceramics, selenium finds an important place in imparting color to various red enamels. The resistance of vulcanized rubber to abrasion is increased 50% by the addition of selenium.

Selenium has, of course, played an important rôle in the development of new means for the transmission of information. It is used in certain devices which transmit photographs by wire, and is also employed in instruments for synchronizing sound with motion pictures. On the sea, it has become the automatic hand which lights navigation beacons when darkness comes.

Still other uses for the metal are as fireproofing for cables, and in the form of diethyl selenium as a warning scent added to certain odorless commercial gases, including carbon monoxide.

### *Four Thousand Pictures a Second*

LAST April The Review reproduced some remarkable photographs of a falling drop of milk taken at a speed of 480 exposures per second. Professor Harold E. Edgerton, '27, and Kenneth J. Germehausen, '31, of M. I. T.'s Department of Electrical Engineering, who took these pictures, have now refined their methods of high-speed photography to the point where photographs at the rate of 4,000 a second are being made with exposures ranging from  $1/100,000$  to  $1/500,000$  of a second.

To take pictures at such amazing speeds Messrs. Edgerton and Germehausen use a unique electrical circuit which produces flashes of great actinic intensity and many times more brilliant than sunlight. The circuit employs either mercury arc tubes or spark gaps and by means of it both still and motion pictures may be made.

The light produced by the new circuit occurs in pulses or flashes, and the intensity of each flash is equal to the concentrated light of approximately 40,000 ordinary 50-watt bulbs such as are used in household lighting. The scientific importance of the method lies in the fact that the frequency of the flashes or the moment of starting may be accurately controlled. In making motion pictures the pulse of light is synchronized with the speed of the film, which moves past the lens aperture at velocities up to 200 miles an hour.

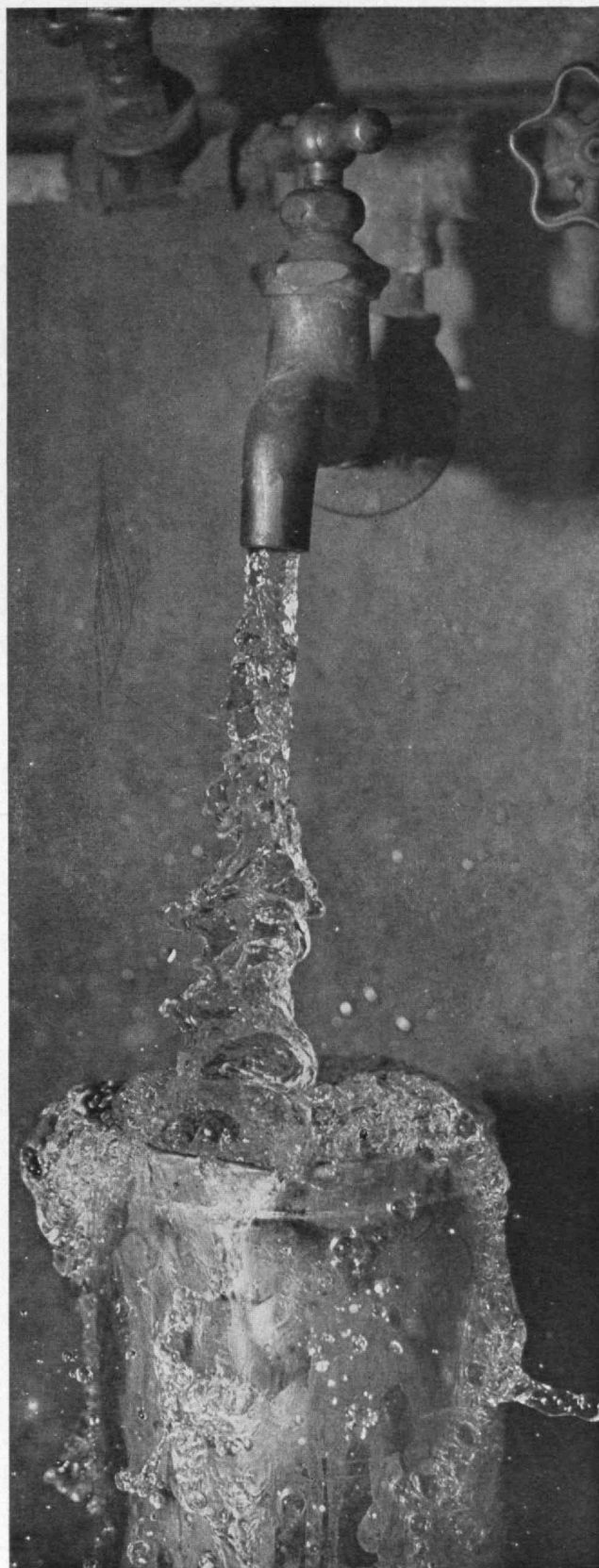
As a tool for research, this device opens new prospects for study. It is compact and portable, and is expected to be of great value in the photography of transient motion, types of motion which occur only once. To the scientist it offers unusual opportunities for the study of motion in liquids and gases. Laboratory studies of the wing motions of birds and insects are also expected to be possible by this method.

Already the device has been used to make striking photographs in which familiar things are shown in astonishing new forms. The splash of a drop of milk on a hard surface is revealed in the shape of a miniature crown tipped with infinitesimal pearl-like drops. The question, "How quick is quick as a wink?" was answered by photographs of the human eye which show that a wink occurs in approximately one-fortieth of a second. On the opposite page the photographic image recorded at the instant of impact between a golf club and ball shows clearly the momentary flattening of the latter at the point of contact.

The chief feature of the electrical circuit, which makes this type of photography possible, consists of mercury arc tubes or spark gaps which are made to produce intense, extremely short flashes of a bluish white light. Electrical energy from an ordinary house lighting circuit is "stepped up" in voltage and stored in condensers. The light is produced when the electrical energy is quickly changed to heat and light by discharging the condensers into the mercury tubes or spark gap. The operation is quite similar to a bolt of lightning. In nature, clouds play the part that the condensers have in this device by storing up electrical energy.

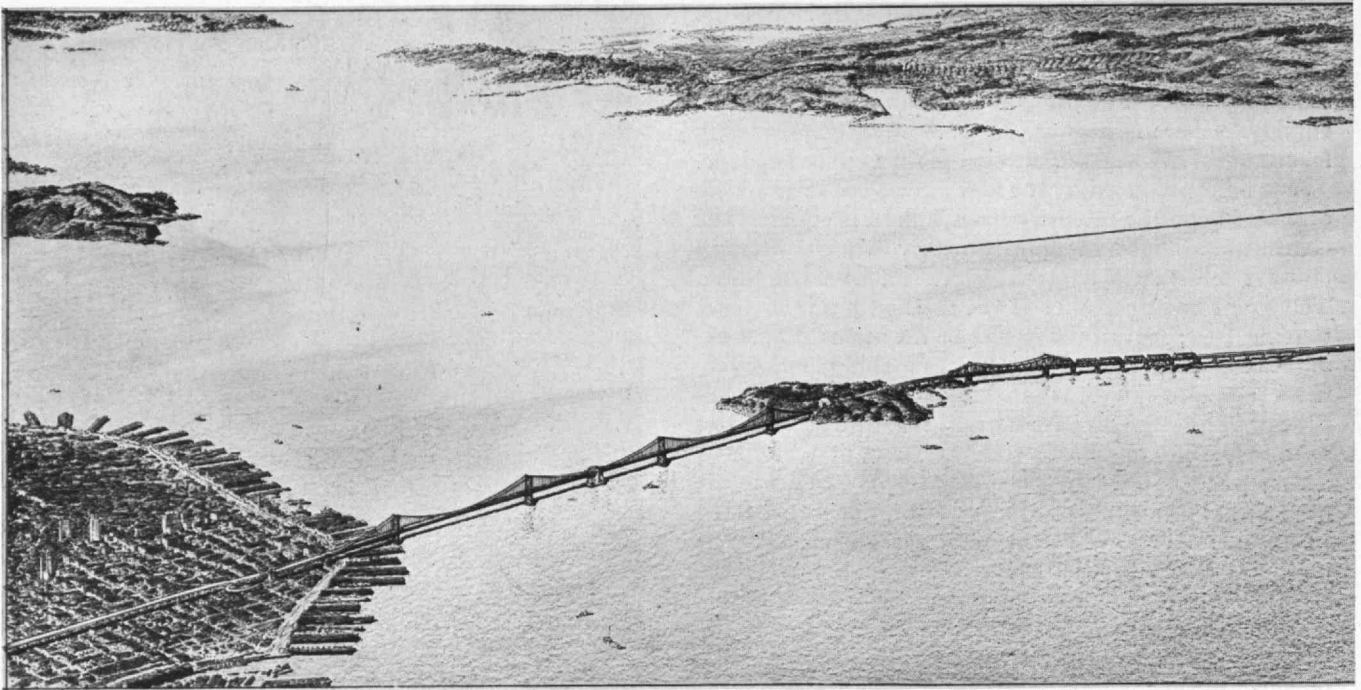
The air acts in the same way as the mercury tube by suddenly discharging the energy with resulting heat and light. However, there is one fundamental difference. Lightning cannot be controlled, while the mercury arc tube can be accurately and easily governed by means of a novel circuit utilizing a thyatron tube.

When this device is used, for example, in making motion pictures, a commutator on the sprocket which drives the film through the camera comes in contact with a small brush, which in effect is a switch. One of the striking features of the circuit is that a current of a few thousandths of an ampere in the brush is sufficient to operate the thyatron tube, which in turn causes a current of several thousand amperes to flow instantaneously through the mercury tube, thus producing the flash.



*Stop-motion picture of water flowing from a faucet. Exposure: 1/50,000 sec. Note that the water is stream-lined near the faucet but quickly breaks up into turbulence. The unaided eye would never see this definite pattern because the form changes so rapidly that only a blurred vision is possible. It is a simple illustration of super-speed photography in studying transient motion. See adjacent column for description of how picture was taken*





*Preliminary design of the world's largest bridge, which is to be thrown across the bay between San Francisco and Oakland. Its construction is assured by a grant from the R.F.C. of \$62,000,000 — the largest loan yet made by the R.F.C. for a self-liquidating project*

The device is a further development of Professor Edgerton's research which two years ago led to his design of a new type of stroboscope. By the use of extremely brief flashes of intense actinic light, this "whirling watcher" made possible stop-motion photography of machinery moving at high speeds.

### *Notes on Gun Powder*

SINCE the World War we have heard little about advances in military science, particularly ordnance. In an effort to fill the gap we have lately been asking questions about gun powder and, happily enough, Professor Tenney L. Davis, '13, one of our Contributing Editors, has answered them, he being an authority on explosives.

*What are the disadvantages of ordinary black powder?*

Black powder burns to produce a voluminous white smoke, which of course helps to show the enemy the position of the battery, but the smoke has another more serious disadvantage. The smoke constitutes about 54% of the weight of the original powder. It consists of finely divided solid matter, not gas, and it is the gas from the powder which causes the motion of the projectile. The smoke, therefore, represents, out of 100 pounds of powder, about 54 pounds of weight which is not convertible into projectile velocity. Black powder burns quickly. In an exceedingly short interval of time it changes from a compact solid to a voluminous and hot mass of smoke and gas. There is a large and sudden rise of pressure behind the projectile. The projectile starts to move under the force of this pressure, the gas expands and the pressure drops, and the projectile when it reaches the muzzle is actually moving less rapidly than it was a moment earlier farther back in the barrel of the gun.

The sudden pressure produced by the burning of black powder is well known to everyone who has experienced the kick of an old-fashioned shot-gun. The effect upon the projectile is that of a sudden and powerful but momentary blow from behind, not the effect of a persisting push. Cannon which used black powder were heavy and unwieldy weapons, built to withstand the high and sudden pressure, very thick at the breach, and tapering, but still very thick at the muzzle.

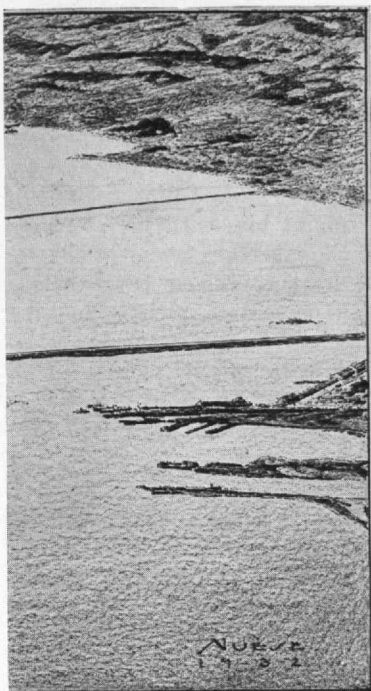
Black powder is stable and will last forever if it is kept dry and is left to itself. During the Great War the French used, in the igniter bags of their modern artillery, black powder which had been made for Napoleon's army and had long been in storage. Indeed they regarded this old powder as something very special and choice, perhaps because of their habit of dealing so generally with a commodity which really does improve with age. But the powder had been kept dry.

*What are the characteristics of modern powders and how have they been improved?*

Smokeless powder produces a small amount of thin gray smoke, but otherwise it burns completely into hot gas which pushes the projectile. It is very much more powerful than black powder. Its history is the story of making it slower, making it stable, making it cool-burning, and making it waterproof or indifferent to moisture. Our present smokeless powder is probably stable enough to last for 20 years, no more. And we have special smokeless powder which is so cool that it gives no visible flash from the muzzle of the gun.

When nitrocellulose or guncotton was discovered, its explosive power was recognized at once and it was tried in cannon, in the sturdy cannon of the time which were designed for use with black powder. But the nitrocellulose burned so rapidly that it blew the cannon to pieces before there was time for the projectile to be started.





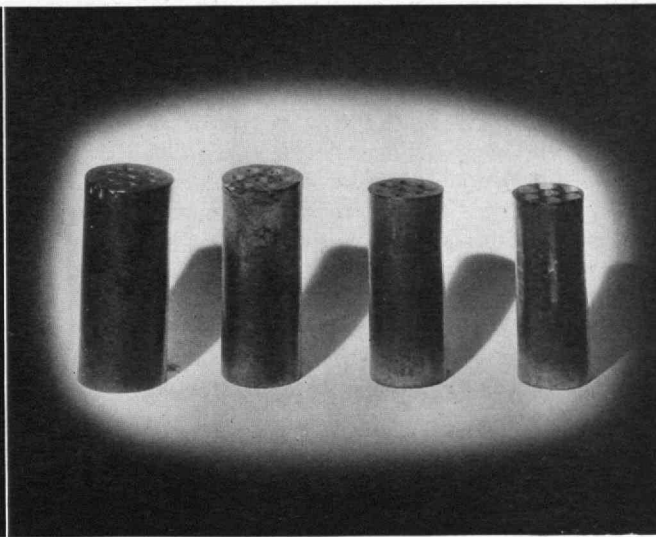
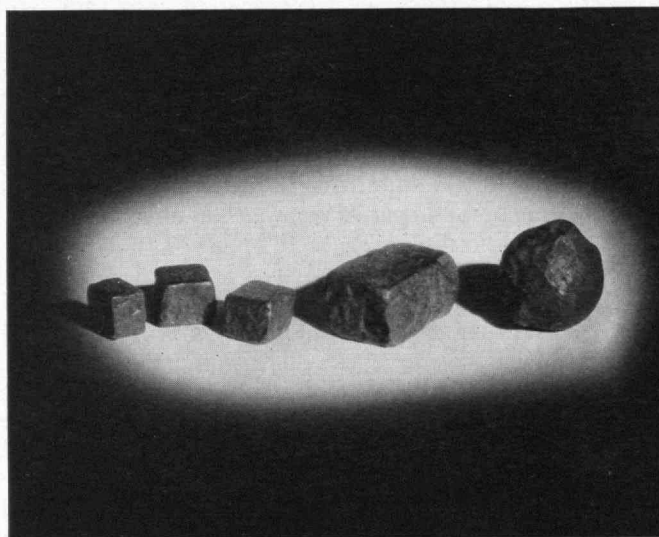
By converting the nitrocellulose into a homogeneous colloid and shaping this into grains, a powder was secured which burned more slowly, more slowly even than black powder. English Cordite and Italian ballistite are colloids of nitrocellulose with nitroglycerine. They are indifferent to moisture because of the oily nature of the nitroglycerine which they contain, and they are powerful and hot and erosive in the gun. French, Russian, and United States powders are "straight nitrocellulose" colloids. They are cooler and less erosive than the nitroglycerine powders. They

take up moisture from damp air, and must be shipped in sealed containers. The powder for our military rifles consists of small, short cylindrical grains, thinner than the lead of a lead pencil, each grain having a single perforation. The larger grains for the larger guns have seven perforations. A single grain of the powder for the 12-inch gun, for example, is a multi-perforated cylinder about three-quarters of an inch in diameter, about an inch and three-quarters long, and weighing about three-quarters of an ounce. It almost seems unreasonable to call such a thing a "grain."

Colloided powder burns slowly. It is possible to hold a grain of convenient size, say a grain of the powder for the 75 mm. gun, between the thumb and forefinger and to light it with a match and then blow it out, and the process may be repeated two or three times without burning the fingers. The grains are "progressive-burning," that is, they burn from the point at which they are lighted. When the flame from the primer or igniter sweeps into the chamber of the gun, the grains begin to burn all over their surface. They burn from the outside inward and from the perforation outward. A single-perforated grain thus has a constant burning surface until it is entirely consumed — a simple matter of geometry — and a multi-perforated grain has a burning surface which increases as the burning progresses. The production of heat in the chamber further increases the rate of burning. In consequence, the powder gases *push* the projectile and continue to push it with an ever increasing pressure until it emerges from the muzzle of the gun, at which moment, if everything has been designed correctly, the powder is burned completely. Lighter guns are possible, and rifling which imparts a rotatory motion to the projectile and greater stability in flight. High velocities are attained. The bullets from our military rifles have a velocity at the muzzle of something over half a mile a second.

The gases which follow the projectile from the muzzle are white hot and dazzlingly brilliant at a temperature of 2,700° to 2,900° C. The flash from a 16-inch gun has been known to singe the fibers from a rope 150 feet distant from the muzzle. Although the sound from such a gun is not audible more than six miles away, the flash may be seen at a distance of 30 miles.

By the introduction of suitable materials into the nitrocellulose colloid it is now possible to produce powder which is as powerful, weight for weight, as the



M. I. T. Photo

**RIGHT PICTURE.** Napoleon's Powder (rhomb-shaped grains on left) and a grain of U. S. Civil War Powder (right). The larger grains require more time for their burning and were intended for use in the larger cannons. **LEFT PICTURE.** How smokeless powder burns. On left a new grain and proceeding rightward, grains which have been shot once, twice, and three times, from a 75 mm. gun. A grain of 12-inch powder was loaded into a 75 mm. gun along with the usual charge of 75 mm. powder. When the gun was fired, the large grain burned all over its surface — and the same thickness was burned away from it as was burned away from the smaller 75 mm. grains during the process of their complete combustion. The unburned portion of the large grain was thrown from the muzzle and extinguished by contact with the air. The process was repeated twice, the perforations becoming larger and the external diameter smaller with each repetition. A fourth experiment would have converted the grain to "slivers." See article beginning on page 60

standard service powder, but which is entirely flashless in many of the guns. The two best ways of accomplishing the result are by the admixture of a cool explosive like nitroguanidine (which alone explodes to produce a temperature of only  $907^{\circ}\text{C.}$ ) which gives a larger volume of gas at a lower temperature, and by introducing some carbonaceous material into the colloid in such manner that, while the nitrocellulose alone would produce one molecule of carbon dioxide, the nitrocellulose plus the carbonaceous material now produces two molecules of carbon monoxide, or more gas at a lower temperature. Nitroguanidine is soluble in water, but the second method is applicable to nitroglycerine-nitrocellulose powders and yields a powder which is both flashless and entirely indifferent to moisture.

Flashless powders produce somewhat more thin gray smoke than does ordinary smokeless powder, but they produce no visible flash and, being cooler, are less erosive and give longer life to the gun. At night they give a dull red glow in the neighborhood of the muzzle, similar to the glow of a cigarette, and the glow is not visible for a distance of more than a hundred yards or so. The glow is entirely without actinic power and does not affect a photographic plate.

We have powder which is smokeless, flashless, cool, and indifferent to moisture, but the powder is not yet stable and can probably not be depended upon to last longer than two decades. The best opinion appears to be that a smokeless, flashless, non-hygroscopic and perfectly stable powder, when it is made, will not be made from nitrocellulose.

### *A Mathematician in Europe*

OUR European representative, Professor Norbert Wiener, after winding up his year in Europe with a visit to the International Mathematical Congress at Zürich, wishes to give expression to the following reflections and observations:

#### AMERICAN MATHEMATICS

American mathematics was well represented at the meeting and two of the general lectures which received the most attention were those of Alexander of Princeton and of Morse of Harvard. A few days before the meeting, Professor Ostrowski of Basle told me that if things went on the way they seemed to be going, the next edition of an international encyclopædia of mathematics would have to be edited in America 20 years hence.

There were a great many inquiries for Technology mathematicians at the meeting. In particular Professor J. Douglas' work on the problem of Plateau came in for a lot of attention, and has been made the theme of many seminar discussions, particularly in Berlin.

#### MODERN TRENDS IN MATHEMATICS

Modern physics and modern mathematics are exerting an enormous mutual influence. In particular, the theory of groups and the theory of measure are showing themselves extremely useful tools for the theoretical physicist. The theory of measure seems to be the basis for the Gibbs statistical mechanics and for much of the theory of probability. In this connection the

recent work of Koopman, Birkhoff, Von Neumann, and Professor Hopf of the Institute deserve special mention.

The change in the center of mathematical interest has been so considerable that a prominent young American mathematician, trained some seven or eight years ago at Harvard, confided to me that apart from its value in developing mathematical maturity, his training had been quite inadequate to acquaint him with the ideas really agitating the minds of the mathematicians of the present day. In particular, he complained that the modern theory of algebra, as represented by the school of Miss Noether and of Van der Waerden, was simply ignored. Furthermore, the Lebesgue integral played no part in his training and he had to study it up by himself after graduation.

#### BOOKS

There seems to be a most unusual activity among mathematicians in the writing of textbooks on intermediate and advance subjects. This has been going on for some time in Germany and in France but at the present time one scarcely meets a single English-speaking mathematician who is not in the position of being about to write a book, in the throes of writing a book, or just having written a book. Among books to be mentioned are: Stone's colloquium lectures on transformations in Hilbert space; Ritt's colloquium lectures on the algebraic treatment of differential equations; Morse's colloquium lectures on analysis situs; Besicovitch's "Almost Periodic Functions"; and Linfoot's forthcoming book on the same subject. In Germany Bochner is getting out a most interesting treatise on the Fourier integral. Your correspondent is reading the proofs of his book on the same subject which is going through the Cambridge University Press. The Press is also publishing a tract on "Radiative Equilibrium in the Stars" by Professor Hopf of the Institute.

#### INTERNATIONAL RELATIONS

Relations between mathematicians of different countries seemed better than I had seen them on any previous occasion. The ghost of the International Mathematical Union, a product of the War and for many years an instrument for the suppression of international relations with German mathematicians, was laid once and for all.

#### ZÜRICH

The meeting in Zürich was conducted in wonderful style. Professor Fueter's presidency was most tactful and efficient. I was particularly impressed by the beautiful, slumless city with much modern domestic architecture in excellent taste, and by the intelligence and understanding evinced by federal, cantonal, and municipal dignitaries in the speeches at the public meetings. The closing session, in which we adjourned until Oslo four years hence, was rendered dramatic by the mad attempts of a circle squarer to secure a hearing.

#### MISCELLANEOUS EXPERIENCES

Your correspondent had the great fortune to make a hiking tour in Wales together with Professor J. B. S. Haldane. Haldane was much impressed with the wealth of problems which the new field (*Concluded on page 74*)



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# THE INSTITUTE GAZETTE

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## Exchequer

TECHNOLOGY'S fiscal 1932, which ended June 30 last, is set forth in detail in a 78-page document presented to the Corporation last month as the Annual Report of the Treasurer by Everett Morss, '85. It shows that the Institute's net operating income and expense figures exceeded the three million mark for the first time and that, in a year of financial stress when many educational institutions incurred heavy deficits, the Institute expended but \$15,575 above its receipts.

Capital gifts (not including those to the Technology Loan Fund) during the fiscal year amounted to \$1,582,355, or \$393,015 more than in fiscal 1931. They included an additional \$884,327 from the estate of Henry Clay Frick and an additional \$491,054 from the estate of Elizabeth R. Stevens. Miscellaneous gifts during the year totaled \$199,117, or \$50,078 more than in fiscal 1931.

Gross expense for the year exceeded gross income by \$236,616, and net expense exceeded net income by \$15,575, leaving the current deficit (cumulative since 1865) shown on the Treasurer's balance sheet as \$29,699.

Since the \$500 tuition rate became initially effective for 1931-1932, income from students was \$1,589,668, an increase of \$267,841, or 20.2%, above fiscal 1931. Income from invested funds was \$1,238,346, a drop of \$59,484, or 4.6%, from the preceding year; and income from other sources also declined to \$201,866, down \$58,607, or 22.5%. Concerning the drop of 4.6% in income from invested funds, Mr. Morss comments:

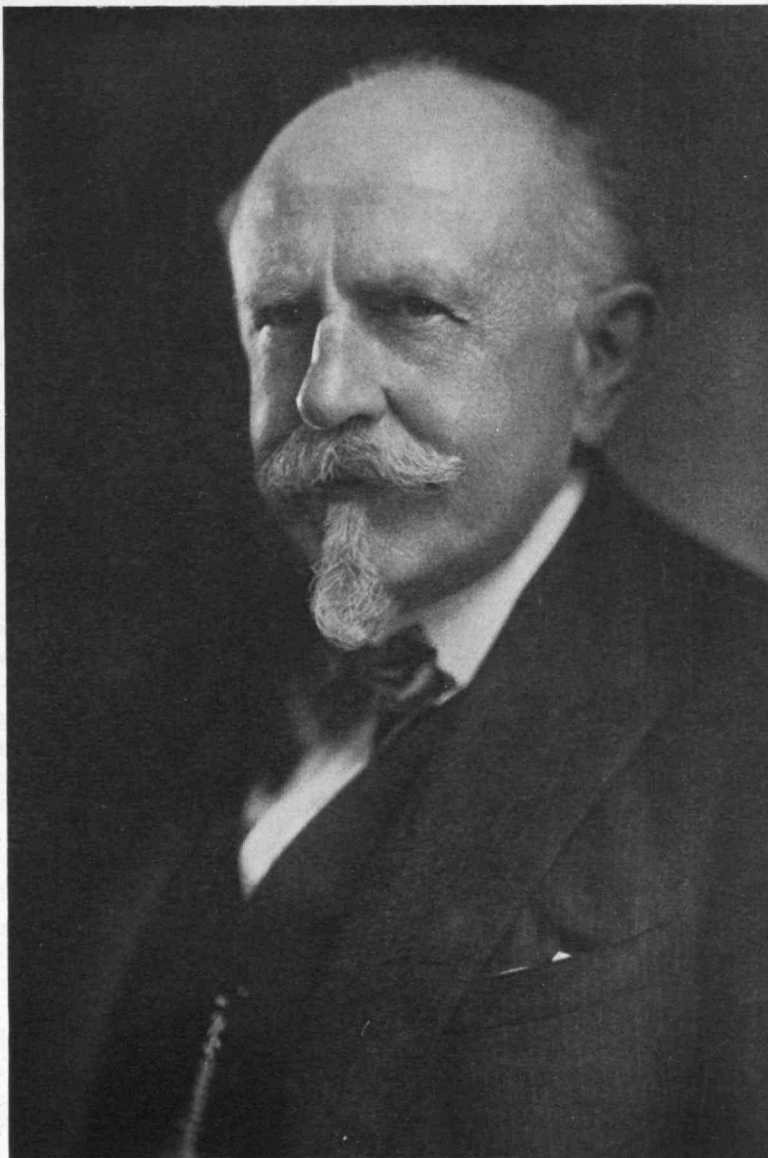
"On account of reductions in dividends, a single default in bond interest, and less income from real estate, income from funds existing at the beginning of the year fell off \$97,000. Funds received during the year yielded an income of \$38,000, resulting in a net reduction of \$59,000 in income from investments."

The Institute's net operating expense items for fiscal 1932, and how they corresponded with those of the preceding fiscal year, were: academic expenses \$2,039,517, an increase of \$263,348, or 14.8%; administration costs \$332,776, a decrease of \$16,971, or 0.5%; plant operation and maintenance \$377,353, a decrease of \$39,148, or 9.4%; miscellaneous expenses \$300,424, a decrease of \$75,194, or 20%. The Institute's net operating expense during fiscal 1932 was at the rate of \$8,333 per day (not including \$2,430 per day for research and special payments) as against \$7,994, \$7,600, \$7,150, \$6,300, and \$6,200 in the five previous years.

Capital additions to the Institute's educational plant during the year totaled \$961,012, covering the completion of the George Eastman Research Laboratory and the Spectroscopic Laboratory. The book value on June 30, 1932, of the item "Land, Buildings, and Equipment" stood at \$15,706,340.50.

"Endowment Assets," as of June 30 last, had a recorded book value of \$32,651,407.78. Relative to the Institute's investments, Mr. Morss says:

"In 1930, 13 securities in the General Investment Account were marked up a total of \$1,740,000. All of these securities have now been marked down to their original book value with a corresponding reduction in the total of each fund in the account. . . .



"One of America's ten greatest engineers," John Ripley Freeman, '76, who died October 6. See the sketch of his life on next page



"The grand total of all funds now stands \$1,170,000 less than a year ago. Due to economic conditions, the market value of all our securities, as of July 7, 1932, is about one-third less than the book value."

The rises in security markets since last summer had, of course, improved the Institute's "market-to-book" ratio by the time Mr. Morss submitted his Report to the October meeting of the Corporation.

### John Ripley Freeman, '76 (1855-1932)

THE Institute lost one of her most distinguished sons, and American Engineering one of its greatest ornaments, when John R. Freeman died on October 6. Although he was 77 years old, he was vigorously active almost until the end, and it was only last spring that he completed and published his book, "Earthquake Damage and Earthquake Insurance," which climactically and fittingly brought into focus his two major life interests, engineering and insurance.

His rise to a dominant figure in the fire insurance field was the result of his achievements as an engineer. After graduating from the Institute, Mr. Freeman became assistant engineer to the Water Power Company at Lawrence, and from 1878 to 1886 he was assistant to Hiram F. Mills. During this period he conducted the research which was assembled in the following papers that are now classics in the literature of hydraulics: "Experiments Relating to the Hydraulics of Fire Streams" (*Trans., Am. Soc. C. E.*, Vol. 21); "The Nozzle as an Accurate Water Meter" (*Trans., Am. Soc. C. E.*, Vol. 24); and "The Arrangements of Hydrants and Water Pipes for the Protection of a City Against Fire" (*Jour., N.E.W.W. Assn.*, Vol. 7).

As the titles of these papers indicate, Mr. Freeman's work was leading directly into the field of fire prevention and it was logical, therefore, that the Associated Mutual Fire Insurance Companies of Boston should have sought and secured his services in 1886. Ten years later Mr. Freeman left Boston for Providence to become President and Treasurer of the Manufacturers Mutual Fire Insurance Company. This company was later affiliated with others and Mr. Freeman thereby became the head of the largest organization of its kind in the country. When Mr. Freeman became President in 1896, the insurance in force in all of the mutual companies was about one billion dollars and the loss per \$100 of risk was around 27 cents per year. In 1930, according to reports of these companies, the insurance in force was over ten billion dollars and the loss had been reduced to 1.9 cents per \$100 of risk. These companies have returned to some classes of their policy holders in dividends about 96% of their premiums. For these savings Mr. Freeman was largely responsible.

However great has been his responsibility, Mr. Freeman never permitted his interest in engineering to diminish. It became a source of great amusement to Mr. Freeman that to one group of friends he was known only as the President of large insurance companies, while to another he was known only as an eminent consulting engineer, whose services were sought throughout the world.

His engineering achievements included such work as consulting engineer for the Chinese Government in the Grand Canal project; the survey for the Greater New York water supply system in 1899-1900; consulting engineer for the Panama Canal locks and dams in 1907 and 1909; consultant for water-supply construction and investigation in Los Angeles, San Francisco, and Baltimore; for regulation projects on the Great Lakes; the Canadian Government's water-power conservation plan; for water-power development on the St. Lawrence River; and for sanitary and drainage problems of the Boston Metropolitan Park Commission.

It is evident that Mr. Freeman's engineering achievements covered a notable span. As his last book indicates, he made himself an authority in seismology and in the design of structures to resist earthquakes. He was one of the first engineers to realize the importance of geology in connection with engineering structures and he was probably the greatest factor in America for bringing engineering geology to the service of the engineering profession.

Throughout his life Mr. Freeman devoted a large part of his time as an engineer to public service and in his latter days he contributed both of his wealth and time to the advancement of the public good. He made substantial gifts to the A.S.C.E., the A.S.M.E., and the Boston Society of Civil Engineers, to be used by those societies in aiding "young engineers in experiments, observations, or research for the purpose of securing new and accurate engineering data." The engineering societies used these funds in the form of traveling scholarships, and many promising young men were thereby enabled to study in European laboratories. Mr. Freeman made other funds available to M.I.T. for traveling fellowships, for research in hydraulics, and for publication of important books in the field of hydraulics. (The Institute now has in preparation three books, the translation of which has been made possible by Mr. Freeman's generosity.) It was the result of Mr. Freeman's efforts that Congress recently made available \$350,000 for the construction of a national hydraulic laboratory in conjunction with the Bureau of Standards. The present renaissance in hydraulic research in the United States stems almost entirely from that roll-top desk in Providence, where Mr. Freeman led his double life of engineer and business man.

(Continued on page 70)



# *He is calling You !*



You are likely to think of the telephone from your individual point of view, as a convenience, as a necessity, as a means of transmitting to others your own thoughts and desires.

But your telephone is of equal importance to those who wish to get in touch with you. Right now as you are reading, someone, somewhere, may be calling you. It may be merely a friendly greeting . . . or news of importance to change the course of your life.

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## DOMESTIC AIR CONDITIONING

(Concluded from page 49)

those households which could afford this amount of money per month, simpler and more inexpensive means of developing cooling would have to be provided before cooling could come into general use.

Finally, there is the question of the demand on the public water works for condenser water. The very best systems of compressor refrigeration, steam ejector, or adsorption systems would take from two to five gallons of water per ton per minute. This means from 120 to 300 gallons of water per hour per house. Over a 10-hour cooling period, from 1,200 to 3,000 gallons of water per day would be required. As the use of cooling became more general this drain on the public water works would become excessive and the owner or user would have to resort to cooling towers of some sort of which the cheapest now made would run about \$300.00 installed, and would require a certain amount of additional electricity.

Although no definite prediction can be made as to the exact type of air conditioning apparatus or air conditioning system which will be adequate to provide the comfort and economy which is essential to its growth and utilitarian possibilities, it is possible from the short description which I have given of the essentials of air conditioning to say that evaporating pans of every description will not be acceptable; that cast iron radiators with their bulk, unsightliness, inconvenience, and dirt will not be part of the air conditioning systems of the future; that unsightly fan housings and bulky enclosures can hardly be tolerated; that unit coolers that have no function in the winter time, are expensive to run, occupy too much space, and are uneconomical in water consumption and electrical consumption; that artificial refrigerants as an integral part of the equipment are merely a makeshift expedient to tide over a period of development; and that any device that requires water and drain connections, refrigerating pipes, and covering when located anywhere except in a central position or in the basement of a building, cannot hope for any future in this field. There is a bright future for a system free of these faults and fulfilling the definition of air conditioning given at the beginning of this article. This system will embody a simplified device functioning for all seasons of the year and producing under varying conditions of inside and outside temperatures and humidities variable results within the control of the operator. And it will be a system that will operate at a cost per month not exceeding the present average cost of heating per month. When and only when such a plant is perfected, can we look forward to a bright future in the air-conditioning field.

It must be remembered that cooling for comfort in the average home or office is as young as the automobile was in 1905, and, with far less complications and far less mechanical difficulties to overcome, it is easy to visualize our comfort conditions brought to the efficiency and relative cost of the present automobile in far shorter time than the automobile has been brought to its present stage of development. I believe that engineers will make air conditioning economically feasible.



## EDUCATING FOR RESPONSIBILITY

(Continued from page 52)

accordingly or resort to a weeding-out process thereafter. Hence, while higher education became more popular, it suffered somewhat from its popularity. The schoolboy attitude was projected into the higher institutions, and students of an age to be made of sterner stuff were coddled along with a short-view daily assignment and recitation system hardly different from the elementary schools. Excellence in scholarship was frowned upon by the majority of the students and hence, unless offset by unusual personal charm, frequently constituted a major social disqualification. Among students and even among numerous educators the granting of special opportunities and encouragement to the more gifted students was viewed as a cardinal sin against democratic ideals. For this reason, and through sheer force of number of students, a "good" student was merely one who "got" his lessons, attended his classes, and passed his tests and examinations, and hence gave the professor no trouble. In short, it was the heyday of the "gentleman's mark."

The feeling that too many graduates of higher institutions in this country, though not perhaps remaining "superbly null," nevertheless failed to rise to positions of importance in their various fields of endeavor prompted considerable self-analysis on the part of some institutions and considerable study of the educational situation here and abroad on the part of a number of educational societies and foundations. While much has come out of these studies, and there still is debate

over the relative merits of American and European systems of education, those American institutions which have profited most from the studies have recognized that to attempt to make a wholesale importation of one of these foreign systems is highly inappropriate, but at the same time they have recognized the one lesson which educators in this country needed impressed upon them: *that the European student carries intellectual responsibility and obligation which cannot be evaded.* In one of his reports as director of an investigation of engineering education for the Society for the Promotion of Engineering Education, William E. Wickenden, now President of the Case School of Applied Science, said: "We have to compensate for the results of a scheme of secondary education . . . comparatively flabby and superficial. We shall lag in the higher stages of technical education unless we can get our abler students to assume much more initiative. Our whole set-up tends to become a scheme to *give* students an education. Too often our colleges are highly elaborate schoolhouses, our students are overgrown schoolboys, and our professors glorified schoolmasters. . . ."

Within the past decade the chief attempts to improve the quality of higher education in this country have centered around the establishing of "honors courses" for the more brilliant students in well over a hundred colleges and universities. These courses acquire their name from courses of similar name in the English universities of Oxford and Cambridge, though many of them have little else in common with the English "honours" and hence create a confusion (Continued on page 68)

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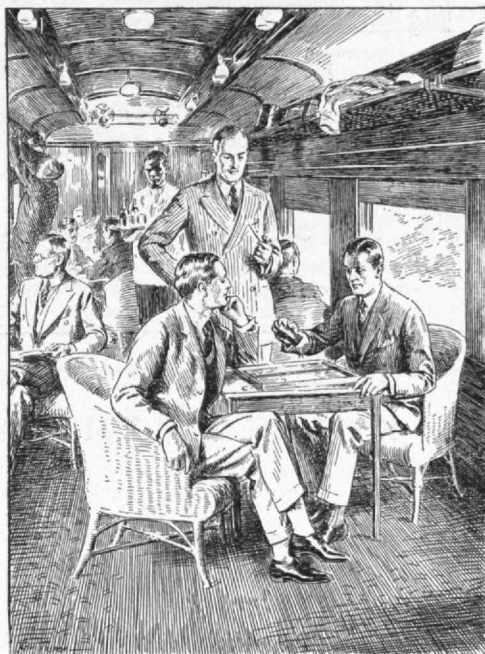
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## EDUCATING FOR RESPONSIBILITY

(Continued from page 67)

of ideas relating to the mere granting of honors for high grades or the accomplishing of work in addition to the usual requirements, or even the "honors system" of unproctored examinations. The English honors courses are characterized by the emphasis they place upon development of the initiative, self-reliance, and sense of responsibility of the individual student, by the freedom which they allow, and by the encouragement which they provide for each student to proceed at his best pace rather than at the average pace of a large group. They are particularly notable because they have fostered so many of the leading scientists and statesmen of England. James Clerk Maxwell and Lord Kelvin each ranked second in his group at Cambridge; Newton also was a Cambridge man, but the records for his year have been lost; Gladstone took a double first, i.e., first honors in two fields of study at Oxford, and so the list might be extended for many pages. The top ranking graduates in this country more frequently sailed from their ports and were heard of no more, while distinction was more likely to come to those who had not allowed themselves to become too immersed in the prescribed routine of the school.

In the present generation, however, a number of studies have shown that this is not so true, particularly among engineering school graduates. It is becoming realized also that the successful "self-made man" is comparatively rare in proportion to the size of the group from which he comes, and that with the increasing complexity of civilization he is likely to become still more rare. At the same time it is recognized that the reasons for his success probably are traceable to the early necessity for the development of resourcefulness, initiative, and courage in dealing with situations which forced him to accept responsibility far beyond the years of his schoolboy brothers. Furthermore, even within the past half dozen years there has been a noticeable increase of interest in scholarship among students all over the country.

While even in the present generation it probably is true that engineers hold a number of positions of leadership, at least in proportion to their numbers, among educated men, the future should see a marked increase in this proportion. The exponents of the so-called "liberal" education are so insistent upon its perpetual monopoly on "breadth" and "culture" that they either cannot recognize or prefer not to recognize that in terms of present-day life it constitutes a most narrow education indeed, and that the stone which the builders rejected has become the corner stone of the structure. However, to borrow a parody from Cyril Norwood, "Theirs not to reason why, theirs but to teach, and die." The value of engineering education in stimulating a broad and analytical outlook upon the conditions of life as they now are (altogether in addition to its service as a groundwork for a professional field) was recognized years ago by the leaders in engineering education. Now it is becoming more and more generally recognized, and in some quarters is hailed as a new idea. Nearly 40 years ago, President Francis Amasa Walker said, in an



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address<sup>1</sup> to Alumni of M. I. T., that the Institute was founded upon several fundamental and far-reaching beliefs, one of which was "a belief that the study of scientific principles directed straight upon practice of a worthy profession constitutes the best kind of education, that education which leads to the most fortunate development of intellect and character, of mind and manhood, altogether in addition to its merits as a preparation for professional success." In a recent address on a similar occasion<sup>2</sup> President Karl T. Compton stated as one of the two objectives of the Institute, "the training of our students to understand and be adaptable in the world in which they live." Certainly this is a specification which the so-called "liberal" education can no longer meet, even though it is the cardinal point of the doctrine of its supporters. On the other hand, the fact that many engineering-school graduates achieve notable success in branches of engineering other than the ones named on their diplomas and in a variety of activities seeming still further afield should not be taken as indication of the failure of the undergraduate process in preparing these men for the branch of engineering intended, but rather as evidence of the breadth of grasp and adaptability which the process has fostered.

Engineering education is not much more than a half century old. M. I. T. still has living graduates of its first class, that of 1868. The total number of engineering-school graduates has been relatively small. The second generation has barely reached the requisite maturity for large responsibilities. However, the numbers of these men are increasing, their opportunities are increasing, and the expectations of the public from them in connection with the present world situation is very great. It is imperative, therefore, that more of them cease to humble themselves as mere tools of the rule-of-thumb business man and self-centered promoter and take courage of themselves to direct large enterprises and become leaders in large affairs.

Though engineering-school graduates frequently have not been viewed with full approval by industrialists, they have never labored under the stigma of the "four years' loaf" attached to the graduate in liberal arts. Engineering-school curricula always have had the reputation of requiring long hours of hard work of an exacting nature, difficult to circumvent. In comparison, the liberal arts student has had a much less arduous time of it, but he has had the advantage of considerable opportunity (perhaps little utilized) for reflection upon the subjects at hand and their relationships. The engineering-school curricula, on the other hand, often tended to approach too much a tread-mill routine wherein so much detail was prescribed for the student that the working hours of the day were so definitely laid out for him that little opportunity was left for him to introduce his own methods and ideas or question very seriously the utility of the procedure imposed without dropping out of step. There was insufficient stimulation of his originality and imagination, and little time for him to let his thoughts run free in an effort to correlate the various things he saw and heard and studied. It appeared (*Concluded on page 70*)

<sup>1</sup> Address at a dinner of Technology Alumni, New York City, 1896.

<sup>2</sup> Address at the Annual Dinner of the M. I. T. Alumni Association, February 6, 1932.



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## EDUCATING FOR RESPONSIBILITY

(Concluded from page 69)

to some that this was a situation more likely to breed followers than leaders. As a consequence several institutions\* giving engineering instruction have inaugurated programs whereby the more promising students are granted considerable freedom from the usual routine of assignments, problems, and reports and are given instead assignments of a broader and more general nature coupled with the responsibility for doing work of a high order. Thus the opportunity for independent study and reflection is given without sacrifice of the standard of accomplishment. Each such student within reasonable limits, and subject to appropriate advice and guidance, must accept the responsibility of planning and organizing his method of investigation and study, and for carrying through. The hope is that the qualities of self-reliance and resourcefulness thus brought into play will continue to be characteristics of the students in their activities subsequent to graduation. If that hope is borne out, then it may be said that engineering education in America has attained its majority.

\* See The Review for January, 1929, for a description by the author of the Honors Group Plan in the Department of Electrical Engineering at M. I. T. See also the issues dated December, 1930, and December, 1931, pages 138 and 148 respectively.

## THE INSTITUTE GAZETTE

(Continued from page 64)

Besides his degree from M.I.T., Mr. Freeman held honorary doctor's degrees from Brown (1904), Tufts (1905), *Sachs Technische Hochschule* (1926), the University of Pennsylvania (1927), and Yale (1931). He has been a member of the Corporation of the Institute since 1893. In 1929 he received an honorary fellowship from the Polytechnic Institute of Karlsruhe, bestowed "in recognition of his pioneer activities as a many-sided engineer in prominent scientific research and his service for the international promotion of hydraulic systems." He was designated in 1927 by the Federal Government as its representative to the Third International Congress of Scientific Management in Rome, and in 1929 he was a member of the Committee of Eighty sent to the World Engineering Congress from America. He had been President of the B.S.C.E. (1893), of the A.S.C.E. (1922-23), of the A.S.M.E. (1904), and he was a fellow of the American Academy of Arts and Science.

The Editors of The Review shall not soon forget his readiness to encourage and help them, or will readers forget the formal articles by him which appeared in these pages. And to paraphrase a tribute presented to him by Walter Humphreys, '97, last year, the Institute remembers him as a brilliant student, a loyal alumnus, twice President of the Alumni Association, and a devoted and generous member of the Corporation for 40 years.

(Continued on page 72)



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## THE INSTITUTE GAZETTE

(Continued from page 70)

### Dr. Tryon's Trips

**T**HIS year Professor James L. Tryon, Director of Admissions and Secretary of the Committee on the Graduate School, will visit educational institutions in states that lie along the Atlantic Seaboard. He will spend the greater part of November and December in the South Atlantic states and will visit the Middle Atlantic states in the spring. In addition to his visits to educational institutions, he will meet Technology Alumni groups and work with Honorary Secretaries along the way. In some cases Honorary Secretaries will arrange his local program.

Cordial letters welcome him from the southern institutions which he first visited in 1928. A considerable portion of his time, whether in the office or in the field, is devoted to educational guidance in the form of interviews with prospective candidates for admission. During the past year he gave about a hundred talks in colleges and schools of the Middle West and the Pacific Coast, speaking to students on technical education, its prerequisites, and the careers to which it leads, and to faculty groups on trends in university education — the summing up of his observations of educational policies, programs, and methods.

Professor Tryon's southern itinerary follows:

#### VIRGINIA

- Nov. 10 — Norfolk — Matthew Fontaine Maury High School
- 10 — Portsmouth — Woodrow Wilson High School
- 11 — Williamsburg — College of William and Mary
- 11 — Richmond — Technology Club of Virginia
- 14 — Richmond — John Marshall High School
- 14 — Richmond — University of Richmond
- 15 — Ashland — Randolph-Macon College
- 16 — Petersburg — Petersburg High School
- 17 — Farmville — Hampden-Sydney College
- 18 — Charlottesville — University of Virginia
- 21 — Staunton — Staunton Military Academy
- 23 — Lexington — Washington and Lee University
- 23 — Lexington — Virginia Military Institute
- 25 — Salem — Roanoke College
- 26 — Blacksburg — Virginia Polytechnic Institute

#### NORTH CAROLINA

- Nov. 28 — Durham — Duke University
- 29 — Raleigh — North Carolina State College of Agriculture and Engineering
- 30 — Wake Forest — Wake Forest College
- Dec. 1 — Chapel Hill — University of North Carolina
- 2 — Davidson — Davidson College

#### SOUTH CAROLINA

- Dec. 3 — Columbia — University of South Carolina
- 5 — Charleston — The Citadel
- 5 — Charleston — The College of Charleston
- 5 — Charleston — Porter Military Academy

(Concluded on page 74)



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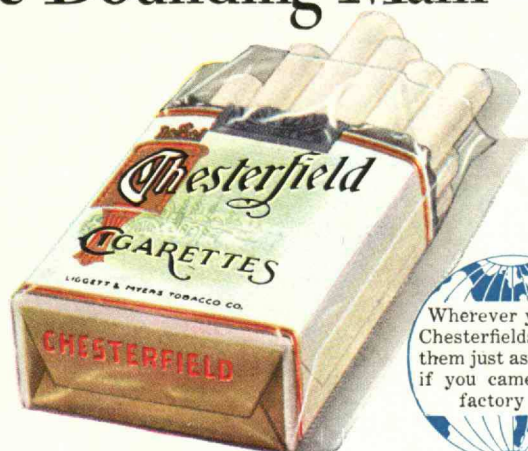
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## THE INSTITUTE GAZETTE

(Concluded from page 72)

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### FLORIDA

- Dec. 6 — Jacksonville — High Schools
- 7 — Jacksonville — Technology Club of Florida
- 8 — Winter Park — Rollins College
- 12 — St. Petersburg — High School
- 12 — St. Petersburg — Junior College
- 13 — Tampa — High School
- 15 — Gainesville — University of Florida

Alumni wishing to communicate with Dr. Tryon should address him in care of the Registrar of the institutions to be visited, or the Admissions Office, M.I.T., Cambridge, Mass.

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## THE TREND OF AFFAIRS

(Concluded from page 62)

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of biological mathematics offers for investigation. For the first time, natural selection is losing the nature of an unscientific catchword and is assuming a quantitative form comparable with that of a law of physics. He feels that it is manifestly time for eugenics to be taken out of the hands of propagandists and zealots and to be subject to a calm, mathematical study.

The depression keeps on getting in its dirty work. The innkeepers of Switzerland are dead broke. The British cannot afford to come, the Germans are not allowed to come, and the French never did come in large numbers. It is not a good time for a country to depend on luxury industries.

One minor impression — the great superiority of the European radio to the radio here. The radio is almost everywhere a government or quasi government undertaking, and is devoted to good music and good talks, rather than to the cheap-jack antics of a parcel of advertising mountebanks. It was a relief to be able to tune in anywhere on a decently civilized program, and not on a medicine-show.

### *The Fabulous Stone*

ASBESTOS, which Pliny called "the funeral dress of kings," has in the ensuing centuries become one of the most widely used mineral substances. Alone or compounded with other metals, it is employed in industry and the home for an amazing variety of processes. One of the most recent is an asbestos and concrete pipe, which has outstanding advantages over metal pipe for certain industrial uses. It is highly resistant to chemicals, and is being used for transporting water which must be free of rust. This pipe withstands temperatures up to 700° Fahrenheit.

From Germany comes news of still another development in which high silica asbestos is being compounded with synthetic resins for the manufacture of large vessels

for industrial processes. From this material, which is produced in a variety of grades, containers as large as nine feet in diameter and ten feet high have already been built.

Asbestos has become so familiar that it is seldom that one considers its early history. The name given to this mineral comes from the Greek word for a fabulous stone which once set on fire could not be quenched. It is a paradox that this name should be given to a substance which resists fire. There is little doubt that the "perpetual" lamp wicks used by the Vestal Virgins were made of crude asbestos fibers. Early records also describe lamp wicks made of Carpasian linen, a mineral fiber from Carpasius in Cyprus. Pliny's reference to asbestos as "the funeral dress of kings" no doubt derived from its use as a shroud for early cremations.

There are three minerals in which asbestos occurs. They are anthophyllite, amphibole, and serpentine. The first two are silicates of lime and magnesia, while the latter is hydrous silicate of magnesia. While asbestos is found in many parts of the world, approximately 75% of the mineral used in North America comes from Canada.

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## THE ALEXANDER DAM

(Concluded from page 55)

benefits. It brings to the engineer who employs them in the right way a perspective of his problem and a sense of the relative weight of conflicting interests. In no other way can the engineer so well grasp these variables in their complicated interrelationship and attempt so to determine them as to produce the most secure and economical design. It appears certain that the application of similar methods to dams to be built in the future will result in the building up of a body of data which will surely and steadily lead to the correction of such errors as exist in our present concepts, and thereby tie our theory and our resulting construction into a harmonious, secure, and accurate whole. By this method will both the art and the science of dam building be advanced.

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## DIVISION OF INDUSTRIAL COÖPERATION



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# M. I. T. NEWS BULLETIN

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PREPARED BY JOHN J. ROWLANDS, DIRECTOR, INSTITUTE NEWS SERVICE

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## *Meteorological Research*

Flights at high altitudes are being made at the East Boston Airport in an airplane specially adapted for research by members of the staff of the Division of Meteorology at the Institute.

This plane, a Curtiss Robin powered with a 165-horsepower Challenger engine, is larger than the ship used by Technology in meteorological studies during the past year. Its cabin has been transformed into a compact laboratory, which includes numerous instruments for making records of temperature, humidity, and atmospheric pressure. The unique feature of the ship is that one section near the pilot's seat is completely enclosed in glass, giving virtually unobstructed vision in every direction. A specially designed hatch in the top of the fuselage just behind the pilot will permit an observer to stand up for unobstructed vision above the ship.

Last winter and during the spring daily flights to a height of 15,000 feet were carried out and much valuable data on atmospheric conditions were gathered. With the new and larger plane, to which has been added new devices for research, daily flights to a height of nearly five miles above New England are planned.

The new research ship is a monoplane with yellow wings and grey fuselage. Its rudder bears a checkerboard design in cardinal and grey, the Technology colors, which will aid in its identity by ground observers, and the letters M. I. T. are painted on the right wing.

The ship carries every instrument of navigation known to aviation. The various operating instruments are mounted on one panel, while on another specially designed shock-absorbing panel are mounted the compass, artificial horizon, directional gyro, and the turn and bank indicator. The latter is operated through what is known as a venturi tube, and to avoid formation of ice, which would close this tube, it has been fixed to the engine exhaust pipe and a current of warm air flows about it at all times. The artificial horizon and directional gyro are driven by a new type of pump fixed on the outside of the ship and operated by a single blade propeller.

The new plane has two speed indicators, one which operates by pressure, while the other is a cup anemometer, which is not easily affected by ice. An unusually large thermometer is fixed outside the ship so that the pilot may note temperature changes and watch the effects on his navigation instruments at all times.

The radio equipment occupies a place near the top of the fuselage to the right of the pilot's seat. Other instruments are

mounted beneath the wings of the ship. Two of these, technically known as meteorographs, automatically record variations in temperature, the moisture content of the atmosphere, and barometric pressure during the flight. This record appears as a thin line traced on a sheet of smoked aluminum foil fastened to a revolving drum. By an ingenious control in the cabin the research pilot or an observer may make special marks on this record indicating the height of clouds through which they fly, and other observations such as snow or the formation of ice.

The research already begun and to be continued this winter includes observation of cloud formations and the motion of air currents in the strata of turbulence encountered up to a few thousand feet above the earth's surface. These research flights make possible studies which are expected to give meteorologists a better understanding of the vertical structure of the atmosphere, which may be visualized as existing in layers of various characteristics for miles above the land.

Further studies of unusual interest are to be carried out in coöperation with members of the staff of the Department of Biology and Public Health at Technology. This work concerns the existence of insects, bacteria, and the spores of fungus plant diseases in the upper levels of the atmosphere. Preliminary studies revealed that some bacteria and molds are to be found at altitudes as high as 15,000 feet above the earth, their natural habitat. A gypsy moth was captured 3,000 feet above the forests of southeastern New England during a flight in coöperation with scientists who are studying gypsy moth control.

This research program is being carried out under the direction of Professor C. G. A. Rossby, Head of the Division of Meteorology at Technology. In direct charge of the studies is Dr. K. O. Lange, noted internationally for his contributions to knowledge of the behavior of air currents. He is particularly well-known for his meteorological work in connection with soaring and gliding flight in Germany, and this summer gave valuable assistance during the American glider flights near Elmira, N. Y. Professor Daniel C. Sayre '23 is research pilot and will make flights five days a week, while Lieutenant H. Harris, relief pilot, will fly on Saturdays and Sundays.

All regular flights will be made early in the morning. Observations gathered during each flight are immediately recorded, and from this data various computations are made. During flights last year surprising differences in temperature were observed. From a comparatively moderate ground temperature the plane

frequently climbed into atmosphere where readings as low as 40 degrees below zero were recorded.

## *Advanced Research*

Two International Research Fellows have selected Technology at which to carry on advanced studies in physics. Dr. Wilhelm Jost, from the Technische Hochschule in Hanover, Germany, has commenced work in spectroscopy with particular reference to photochemical reactions in the Schumann region, under the direction of Professor George R. Harrison. Dr. H. W. B. Skinner, of the Universities of Bristol and Cambridge, is devoting his attention to vacuum spectroscopy and theoretical work under the supervision of Professors Harrison and John C. Slater, Head of the Department of Physics.

Dr. L. A. Young of the University of Michigan has been reappointed National Research Fellow at the Institute, and will carry on studies in theoretical physics.

## *Integrity in Public Life*

The vital importance of fundamental integrity in politics, business, and professional life was emphasized by President Compton in his address of welcome to new students on September 26. Dr. Compton and Professor Frederick S. Woods, Chairman of the Faculty, were introduced to the Class of 1936 by Dean of Students, H. E. Lobdell '17.

"During the past two years," President Compton said in part, "everyone has realized the need of economy. Industries and individuals have been forced to practice it in order to survive. Similarly our government must practice it in order to survive, for the state is also subject to the same economic laws. Political candidates and organizations have preached and advertised economy in their platforms. Non-partisan organizations have pleaded and worked for it. The press has strongly advocated it. The public wants it. Yet despite honest effort and political ballyhoo, what do we see? We see in many cases a mere pretense at accomplishment. I am informed, for example, that in one of the great municipalities in this land, the budget requests of the departments show economies totalling only a fraction of one per cent — and that this is only in supplies and not in payroll — and that there has not even been any reduction in such departments as garbage disposal, whose amount of work has shown marked reduction during the depression.

"This situation I point to as illustrating political dishonesty, not the type which is punishable by law, but which is

failure to perform according to the principles of high moral integrity and social service. Such acts by those in power, whether due to selfishness or cowardice, seriously undermine confidence in our government and are the most dangerous threats to its stability.

"When this depression came upon us and sales fell off, many companies tried to beat the game by putting on the market a cheap line of goods made to imitate goods of high quality and sold at the pretense of a reduction of price. My economist friends tell me that business now realizes that this has been a boomerang and a mistake. The point is that in business, as well as in politics, a high ideal of integrity is a great asset to society. We should practice it ourselves and rally to the support of others who do likewise.

"In professional work there are an infinite variety of tests of integrity, ranging all the way from temptation to dishonesty in specifications, or taking advantage of a client while advising him, to the results of an almost unconscious lack of precaution."

### *Faculty Club*

Guest of honor at the first luncheon meeting of the Faculty Club on September 29 was Dr. E. J. Gumbel, of the staff of the Institut Henri Poincaré, Sorbonne, Paris, and former Professor of Applied Mathematics at the University of Heidelberg. He addressed the faculty members on the subject of "Actual Problems of German Universities."

Dr. Gumbel was in the United States to attend the International Conference on Genetics, of which he has made statistical studies.

### *Cosmic Radiation Studies*

Dr. Ralph D. Bennett, Associate Professor of Electrical Measurements at the Institute, recently returned to his duties after a summer of intensive studies of cosmic radiation among the mountains of California, Colorado, and Alaska.

Dr. Bennett's observations were made in conjunction with the world-wide study of the nature and origin of cosmic rays undertaken this year by the Carnegie Institution of Washington, under the direction of Professor Arthur H. Compton of the University of Chicago.

A portable counting tube apparatus developed by Professor Bennett following preliminary radiation studies in Colorado last year was used at high altitudes to measure the stopping power of different materials for the particles actuating the tube. A cosmic ray telescope was devised, using this apparatus, and aimed at the sun, to detect, if possible, a solar contribution to the intensity of cosmic rays. The result of these observations indicated no such contribution.

Associated with Dr. Bennett in the summer's research were Dr. J. L. Dunham of Harvard University, Dr. Ervin H. Bramhall '27, and Mr. P. K. Allen of Yale University. Dr. Robert B. Brode of

the University of California, and visiting Professor of Physics at the Institute, cooperated with the party in measurements in the California mountains, while in Colorado they had the assistance of Professor J. C. Stearns of the University of Denver. Professor Manuel S. Vallarta '21 of Technology's Department of Physics joined Dr. Compton's party in investigations in the Mexican highlands.

Dr. Compton and his assistants also made measurements in Hawaii, Australia, New Zealand, Peru, the Canal Zone, and northern Canada in the vicinity of the north magnetic pole.

The studies will make possible a direct comparison of radiation intensities at many points on the earth's surface, and are expected to throw light on whether cosmic radiation is corpuscular or electromagnetic in nature.

### *Recognition for Achievement*

The silver medal of the National Association of Cotton Manufacturers, awarded for distinguished and conspicuous achievements and contributions to the textile industry, was presented to Professor George B. Haven '94 at a banquet of the Association in Boston on September 29.

Franklin W. Hobbs '89, President of the Arlington Mills and chairman of the Textile Foundation Board presented the medal to Professor Haven. It is interesting to note that Mr. Hobbs himself was awarded this medal in 1912 for his investigations and researches in wool fibers. G. Gordon Osborne, a research fellow of the Textile Foundation and now carrying on investigations in the microanalysis of fibers at Technology, has also been given this award.

During the past 25 years the Institute has been of considerable assistance to the National Association of Cotton Manufacturers and many other textile organizations. Professor Haven, who has planned and installed several textile laboratories in various parts of the country, has had an important part in Technology's research contributions to the textile industry. His counsel has been sought for solution of many problems, and he has played a notable rôle in the design of special textile machinery and appliances.

The textile work at the Institute was stimulated during the war, when hundreds of samples of various textiles were submitted for scrutiny in the textile laboratory. During that time Professor Haven directed the textile work in the various war schools conducted at the Institute for aeronautical ground training. The work in these schools included study of materials for use in connection with airplane wings, tires, balloons, blimps, and gliders.

The need for research in textiles was early recognized by the Institute, and the development and extension of the textile laboratory under the direction of Professor Haven has kept pace with the times. Moisture control and dehumidification have recently been introduced,

and an especially fine laboratory for the identification of fibers has been established.

Professor Haven was graduated from the Institute in mechanical engineering, and has been continuously interested in textile work in one form or another since his graduation in 1894.

### *Research on the Earth's Age*

Dr. W. D. Urry, a young English physical chemist who is recognized as one of the world's leading experts in the determination of the geological age of minerals through measurements of their radio-active and rare gas contents, has been appointed a research fellow at the Institute.

He comes to Technology from Johns Hopkins University, and his appointment here will enable him to continue his work as a member of a world-wide group who are investigating the age of the earth and its materials, under the leadership of Dr. C. A. Lane of Tufts College and the auspices of the National Research Council.

### *Estonia Honors Herbert S. Gott*

An honorary doctorate was recently awarded to Herbert S. Gott '10 by the University of Tartu, Estonia, in recognition of his many years of constructive service to that country as National Secretary of the Young Men's Christian Association. Mr. Gott received the honorary degree of doctor of economics at a ceremony held during the University's tercentenary celebration, which he attended as a Technology delegate at the request of President Compton. Among other recipients of honorary degrees were the President of the Republic, Jaan Teemant, and the Crown Prince of Sweden.

In a recent letter to Dr. Compton, Mr. Gott described the tercentenary ceremonies, and told of the work of the Young Men's Christian Association in Estonian industries, particularly on the north coast, where trained secretaries have been assigned to five large mills and factories. He went on to emphasize the importance of the Association's efforts to discover and train Christian leadership for the new nation.

### *Study of Unemployment*

Unemployment from technological causes has not been greater in recent years, in proportion to population, than in any other like period in the past century. This is one of the conclusions set forth in the report of the Massachusetts Special Commission on Stabilization of Employment, which recently completed a comprehensive study. President Compton was a member of the commission, which made its investigation under the direction of Harvey A. Wooster, head of the Department of Economics of Oberlin College. A final report is to be made to the Massachusetts Legislature next month.



# ADVERSARIA

## Congratulations

- ¶ To HUGH MACRAE '85, for having an honorary degree of Doctor of Laws conferred on him by the University of North Carolina. (Citation in class notes.)
- ¶ To CALVIN W. RICE '90, Secretary of the A.S.M.E., on his appointment as a member of the National Research Council on the Division of Engineering and Industrial Research, for three years.
- ¶ To WILLIAM H. BASSETT '91, on his election to the Vice-Presidency of the American Society for Testing Materials, at the beginning of their fiscal year on June 24.
- ¶ To GEORGE B. HAVEN '94, professor in charge of textile research at M. I. T., for being awarded the distinguished service medal in textile research by the National Association of Cotton Manufacturers. (See News Bulletin, page II.)
- ¶ To PAUL W. LITCHFIELD '96, for being awarded the "Spirit of St. Louis" aeronautical medal at the sixth national technical aeronautic meeting in Buffalo. He is the second recipient of this medal, the first being Daniel Guggenheim, in May, 1930.
- ¶ To JOSEPH W. BARKER '16, on his election to the Presidency of the Illuminating Engineering Society.
- ¶ To ROLF ELIASSEN '32, for receiving the Tau Beta Pi Association's fellowship for advanced study in hydraulics.
- ¶ To JOSEPH WELCH, JR., '32, for being awarded the annual scholarship to the Babson Institute by the Board of Selectmen of the Town of Wellesley.

## In the News

- ¶ ALFRED P. SLOAN, JR., '95, for being made chairman of a committee of 76 industrial leaders, to be known as the Committee for the Consideration of Inter-Governmental Debts, an attempt to bring practical business opinion to bear upon the debt problems.
- Mr. Sloan is also chairman of the "share-the-work" movement in the Second Federal Reserve District. Among those who will assist in his district, which includes New York State, Northern New Jersey, and part of Connecticut, is FRANK W. LOVEJOY '94, Vice-President and General Manager of Eastman Kodak Company, who has been appointed chairman of Region 2, Rochester. The participation of regional heads "gives the best assurance," says Mr. Sloan, "not only of the practical possibilities of the movement, but of its success as a temporary and emergency measure." Offices have been established at 1775 Broadway, with a staff of volunteer executives contributed by various business concerns.
- ¶ JOHN T. ARMS '11, President of the Society of American Etchers, for presenting to President Hoover a portfolio of 20

etchings by 20 famed U. S. etchers illustrating "important steps in the mental and executive growth of George Washington."

- ¶ THORNDIKE SAVILLE '17, for having accepted an offer from New York University to take charge of the new department of hydraulic and sanitary engineering.

## Political Copper

- ¶ Political campaign cards of copper are the latest style. They are being distributed by LEWIS W. DOUGLAS '17, U. S. representative from Arizona, who is running for reelection this year on the Democratic ticket. The cards are printed as usual but on copper which has been rolled out to a fineness that is considerably thinner than the usual Bristol board commonly used for cards.

## Written

- ¶ By GEORGE B. HAVEN '94, a book entitled "Mechanical Fabrics," published in May by John Wiley & Sons, Inc., New York. The book is the result of 30 years' experience in textile laboratory work.
- ¶ By WM. ROGER GREELEY '02, a book entitled "An Architect Muses," published recently by The Beacon Press of Boston. This book discloses some of the inner workings of the architect's mind, outlining the place of architecture as one of the three necessities of life: food, clothing, shelter.
- ¶ By MYRON H. CLARK '03, a paper entitled "The Development and Application of Standards to Productive Management," presented before a meeting of the Taylor Society in New York City, which received very favorable comment.
- ¶ By JOHN C. BOLLENBACHER '09, a short article in the September issue of *Architectural Record* as one of the six architects presenting a constructive analysis of conditions supporting the belief that the architectural profession can be depended upon to maintain the tradition of sound construction.
- ¶ By DONALD R. STEVENS '11, a paper on "Taking Stock of the Smaller Plant's Advantages," presented at the Second Annual Conference on Management Problems of the Smaller Industries, Silver Bay on Lake George, in July. Mr. Stevens is Vice-President and Works Manager of The Okonite Company.
- ¶ By CLAIR E. TURNER '17, a book entitled "Principles of Health Education," published by D. C. Heath and Company, and dedicated to the memory of William Thompson Sedgwick and Ellen H. Richards, "pioneer educators in the field of health during their years of teaching and research at the M. I. T., which has been favorably received."

- ¶ By GEORGE W. SPAULDING '21, a paper on "Safe Harbor Kaplan Turbines," at the October Baltimore District meeting of the American Institute of Electrical Engineers.

- ¶ By MELVIN C. ROSE '21, a joint paper with H. A. Russell, at the same meeting (A. I. E. E.) on "The Use of Cables for Telephone Distribution Purposes."

## American Chemical Society

- ¶ Elections, by professional divisions, were announced in September for 1932-1933, which list included the following Technology chemists: ALLAN W. ROWE '01, Division of Biological Chemistry; ROBERT T. HASLAM '11, Petroleum Chemistry Division; TENNEY L. DAVIS '13, History of Chemistry; EMERY J. THERIAULT '13, Water Sewerage and Sanitation; JOHN L. PARSONS '18, Division of Cellulose Chemistry.

## Retired

- ¶ WILLIAM C. CUSHING '87, on May 31, from active service as engineer of standards on the Pennsylvania Railroad. (See class notes for account.)
- ¶ GORHAM P. STEVENS '98, from active work as director of the American Academy in Rome after a service of 21 years. JAMES M. HEWLETT, member of the Department of Architecture at the Institute from 1925-1930, will succeed Mr. Stevens, who will still be available for advice.

## Recent Deaths

- ¶ JOHN R. FREEMAN '76, on October 6. (See front part of magazine.)
- ¶ SOLOMON F. CUSHMAN '84, on September 1.
- ¶ HELENA S. DUDLEY '88, in Geneva, Switzerland, on September 29.
- ¶ GEORGE F. RUSSELL '89, in Lawrence, on September 29.
- ¶ FRANCIS W. BELKNAP '95, at New York City, on September 22. (See class notes for account.)
- ¶ RUDOLF HESSE '96, on March 1, 1929.
- ¶ CHARLES A. BARTON '00, at Wilmette, Ill., on January 3.
- ¶ LUCIUS W. GODFREY '00, at San Diego, on April 6.
- ¶ ALBERT G. A. SCHMIDT '00, at Chicago, on April 18.
- ¶ WILLIAM H. FOSTER '04, on May 28.
- ¶ JOSEPH L. LOVETT '04, on May 20, 1931.
- ¶ HERMAN R. SIMMONS '04, at Peacedale, R. I., on April 8.
- ¶ WALTER K. BROWNELL '10, of pneumonia, at his home in St. David's, on August 9.
- ¶ MAX KUSHLAN '11, at Mattapan, on August 5. (See class notes for account.)
- ¶ JOSEPH A. DONOVAN '18, on July 2.
- ¶ JOHN B. KING '23, on July 27.



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# NEWS FROM TECHNOLOGY CLUBS

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## *Technology Association of Japan*

The general meeting of the M. I. T. Club of Japan was held on July 1, the first Friday of the month, at the club room, which is in the San Shin Building near the Imperial Hotel. Anyone having visited Tokyo will remember the Imperial Hotel and the Hibiya Park only a step from the Hotel across the street. The room is decorated with Technology banners, seals, and several pictures of our Institute, which were given by Professor Charles F. Taylor, and we are certainly proud of our room.

After dinner, we had a business meeting, starting with the Treasurer's Report, reports of the monthly meetings during the past year, and the election of the following officers for the coming year: President, Takanaga Mitsui '18; Vice-Presidents, W. W. Stevens '98, Kanezo Goto '11; Secretaries, Masaru Kametani '25, Yoshio Kubota '23; Treasurer, Utaro Tsukakoshi '07; Members at Large, Masanao Endo '16, Keiji Ito '16, and Kaseshi Bitoh '23. Secretary Kametani reported on the death of our late President, Baron Takuma Dan '78.

Our new President is a director of the Mitsui Mining Company and a member of Mitsui Gomei Kaisha (Holding Company). He is a graduate of Dartmouth and later went to Technology. He was unanimously elected President as the most suitable man after Baron Dan's death.

Since last year we have decided to have a meeting every month on the second Tuesday instead of quarterly. At each meeting one of our fellow members, by previous arrangement, gives a talk on the subject on which he is an expert. Thus we have a most pleasant meeting every month. — MASARU KAMETANI '25, Secretary, Mitsui Gomei Kaisha, Mitsui Main Building, Tokyo, Japan.

## *Detroit Technology Association*

On Sunday, July 24, the M. I. T. Alumni of Michigan and Northwestern Ohio assembled at Cranbrook school in the Bloomfield Hills district for a reception and garden party in honor of Dr. Compton. Through the kindness of Cranbrook school the 150 Alumni, wives, sweethearts, and friends who were there had complete use of their grounds and buildings on this memorable day. Cranbrook school is by far the most beautiful preparatory school in the country. Those who attended marveled at its beauty of architecture and landscaping. It is no wonder that the Association of American Architects include it as one of the 34 most beautiful buildings in America. We, the Michigan Alumni, were indeed fortunate to obtain such an ideal setting for our most important party of the year.

The day was a full one. It began at about 10:00 o'clock with registration. During the remainder of the morning Cranbrook students, who acted as guides, took groups through the school and the art academy. Luncheon was served at 1:00 o'clock. After luncheon all adjourned to the Greek Theater, a beautiful open-air amphitheater surrounded by trees, where Dr. Compton gave a most delightful talk. Dr. Compton's talk was preceded by the singing of the President's song and followed by a very enjoyable musicale of songs and æsthetic dancing. After the musicale all there met Dr. Compton personally and were afforded the opportunity of a chat. Dr. Compton, his mannerisms, his smile, and Dr. Compton, the man, struck close to our hearts. We all felt that we had not only met a most delightful personality but also a most capable administrator. For the remainder of the afternoon guides took groups through Kingswood school, the girls' school adjoining Cranbrook, which equals it in beauty of surroundings and architecture. Others golfed at Bloomfield Hills Country Club. It indeed was a most complete gathering, and one which will never be forgotten by those attending.

Two of Michigan's oldest living Alumni were there. They were Goerge H. Kimball '73 and S. Cuyler Green '85. They both enjoyed themselves immensely and the younger men greatly enjoyed them.

The lion's share of the credit for this most successful meeting goes to Edward A. Ash '22, chairman of the Committee on Arrangements. He was assisted by Andrew M. Gault '24, Garvin A. Drew '25, and John E. Longyear '26.

The Reception Committee was headed by B. E. Hutchinson '09. In addition to the following men and their wives on the Reception Committee were: Mrs. B. E. Hutchinson, Colonel Herbert W. Alden '93, Mark W. Allen '96, Philip C. Baker '16, Howard C. Blake '06, Harold Boyer '22, F. F. Campbell, Minot S. Dennett '11, Arthur S. Douglass '08, Howard T. Graber '03, George D. Huntington '98, William R. Kales '92, John Little '23, John Longyear '26, Edward A. McGonigle '96, F. C. Sutter '93, Waldso Turner '05, Edward A. Ash '22, William Donovan, Jr., '24, Andrew M. Gault '24, and C. T. Van Dusen '20. — JOHN E. LONGYEAR '26, Secretary, 2000 Second Avenue, Detroit, Mich.

## *M.I.T. Club of Northern California*

Inverness, about 40 miles north of the Golden Gate, on the lower end of Tomales Bay, was the scene of the last of this summer's outings of this organization. Members and their families and friends to the number of 30 met at this town between 10:00 and 11:00 o'clock Sunday,

September 18, and embarked on two sail boats and a launch headed for one of the small beaches along the bay. All three boats arrived simultaneously which, however, was not surprising due to the fact that the total lack of a breeze forced the sail addicts to accept the towing services of the launch, the only alternative being to row if they expected to arrive in time for noon lunch. After lunch, swimming, rowing, horseshoes, and a keenly contested bean bag game among the ladies, under the able direction of Engineer Woodbridge, occupied the time of those actively inclined. Clear skies and a favorable breeze in the afternoon enabled others to enjoy the sailing offered by Captains Atkins and Parker and their trim crafts.

The success of the picnic was due very largely to the active coöperation of our Inverness hosts, Atkins and Parker, and the thanks of our organization are hereby extended. There is no doubt at all that if we can impose on them in the future, this Inverness outing will be made an annual event.

The present executive committee is planning an interesting series of meetings for the coming season. One of the features of the first social or ladies' evening will be the showing of exclusive movies of the Inverness picnic. They certainly should be good.

An alumni employment bureau has been instituted and qualifications of M. I. T. applicants will be sent out with each mailing in the future. Complete information is on file with the Secretary, and it is hoped that as business conditions improve those M. I. T. men in this district who are now unemployed may find prompt and desirable positions through our group.

Regular Tuesday noon luncheons are held at the Engineers Club, Pine and Sansome Streets, San Francisco, lunch 50¢ or 75¢, with no tip. All M. I. T. men are cordially invited to these informal group meetings. — ROLFE A. FOLSOM '18, Secretary, 150 Hooper Street, San Francisco, Calif.

## *M.I.T. Club of Western Maine*

With 30 present we had a fall outing of the M. I. T. Club of Western Maine on October 2 at Douglas Hill, the closing event of the Douglas Inn. Golf, shuffleboard, croquet, and similar sports were enjoyed and a chicken dinner was served at 1:00 o'clock.

The following officers were elected at the business meeting: President, Orville B. Denison '11; Secretary, Alfred E. B. Hall '15; and Council Representative, Walter H. Norris '93, 24 Glenwood Avenue, Portland. — ALFRED E. B. HALL '15, Secretary, 51 Thomas Street, Portland, Maine.

# NEWS FROM THE CLASSES

1873

The 62nd Annual Meeting and dinner of the Class was held at the Hotel Bellevue, Boston, at 6:30 P.M. on June 8.

The following members were present: Philip Borden, Arthur Forbes, G. M. Thompson, and Frederick Guild. Letters were received from the following members: W. E. Brotherton, W. T. Leman, H. P. Cogswell, S. H. Wilder, George H. Kimball, H. W. Blaisdell. The present address of W. T. Leman is St. Petersburg, Clarion County, Pa.

Dr. Williams, our President, was unable to be present on account of illness. We all sincerely trust that the good New Hampshire summer air will return him to us fully recovered. — A letter from Charles A. Belden, received after the meeting, says he keeps in touch with the M. I. T. Club of Northern California and that his family is well.

The officers elected for 1932 are: President, F. H. Williams; Vice-President, P. D. Borden; and Secretary-Treasurer, G. M. Thompson. The above officers, with W. T. Leman and Frederick Guild of Bay State Road, Boston, constitute the Executive Committee. — GEORGE M. THOMPSON, *Secretary*, 8 Whittemore Terrace, Wakefield, Mass.

1880

It is with regret that I announce the death of Edwin E. Chase on August 11. Only one graduate of '80 beside myself is now left and I can get no track of him. I am over 80 years old and have just begun my 53d year of teaching. The news of Chase's death was received in the following letter from his son, Edwin K. Chase, Class of '06.

"I am sure I have heard Dad speak of you many times and that you have acted as Secretary of the Class of 1880 for many years. My father to whom I refer was a member of that class and because he passed away this past summer on August 11, I am writing this note to you.

"Edwin E. Chase was a Life Member of the Alumni Association and of the American Institute of Mining and Metallurgical Engineers, and was widely known as a mining engineer and geologist until his retirement (sickness) in 1924. He was born in Lowell, Mass., in 1857 and graduated from Technology as did two of his brothers, Roscoe L. '84 in Chemical and Harold M., also Chemical, in '94.

"He was closely identified with the early history of Colorado, where he went immediately after graduation and where he took his bride the following year, who was Elizabeth Sherwood Jewett, also of Lowell. His extensive mine examination work took him to all the well-known mining districts of the North American Continent. During the

World War he was engaged by the Government (dollar a year man) to search for manganese ores in Colorado. Mr. Chase was for many years a resident of Denver, but since 1924 has made his home in Santa Monica, Calif., and it was there his death occurred. Burial was in Denver. He leaves two sons, Edwin K., and R. L. Chase, of Glendale, Calif."

I am keeping busy as director of the Teachers' School of Science, now a part of the University Extension, in which connection I am giving two courses in geology, one in mineralogy and the other in dynamical and structural geology. I am also in charge of a series of field lessons in geology and botany to be given, tuition free, this fall. — GEORGE H. BARTON, *Secretary*, 89 Trowbridge Street, Cambridge, Mass.

1883

Harvey Chase, now located at 49 Federal Street, Boston, has undertaken to organize and administer a department of statistics, covering the astounding growth of federal, state, county, and municipal expenditures and debts since the beginning of the War. This work is being done for the National Economy League.

Mark Lawton writes: "I am glad to see your handwriting, and I should like very much to see you in person. Mrs. Lawton and I were in Italy last fall and we had a delightful time until we reached Rome. There we struck almost a blizzard on the 15th of October, and as you know, they start the heat by the calendar and not by the weather. We were just about frozen and Mrs. Lawton picked up a bad cold. We only stayed there three nights and slipped down to Naples, and she spent the next week mostly in bed. She didn't get over it until way into the winter, but she's quite well now and so am I, and we expect to sail on the *Saturnia* on the 25th of September from Boston.

"This will be our third crossing on this ship. She used to belong to the Cosulich Line before the consolidation. We are looking forward to a very pleasant trip, as we touch the Azores, Lisbon, Gibraltar, Cannes, Naples, Patras, and Ragusa. We shall probably start back from Genoa by the *Roma* on the 20th of October, leave her at Gibraltar and spend a week or two in Spain, and then come home."

Julien Vose writes: "In reply to your card, I cannot give you anything worthwhile. I have been afflicted with tic douloureux and it is Hell. I was taken July 3 and for several days I could not speak nor eat. I am using Nupercaine to numb my jaw. The doctors do not know the cause or any cure.

"I think I have told you about my grandson, the one you met last year in Peabody. He has been my chum ever

since he could walk and for a number of years I have taken him on trips. Last year we went over to Europe and spent some time in each of the following places: England, Scotland, Holland, Germany, Switzerland, Italy, and France. We took a movie camera and have a record of the trip. This year we had planned to take in Zion Park, Bryce Canyon, and the Grand Canyon. My trouble, however, made it impossible for me to go. If you know of any relief for tic douloureux, please let me know about it. Some days I get along very well, while other days the pain is terrible. I suppose that next year we will have a reunion. Fifty years is a long time."

Harvey Mansfield writes: "Answering your card, the past year has been, on the whole, rather uneventful with me, this period having been devoted largely to preparing for what was coming. — While still doing work for the phosphate mining and fertilizer industries with which I have been so long identified, have of late been called into consultation, and devoted much time to air conditioning and refrigeration.

"Interest in this subject has taken a firm grip in this section (as well as in the country generally) and is being recognized by leading architects and engineers generally as the coming industry of the immediate future. Personally, I am so thoroughly convinced of this, that I am now making a speciality of this work and would be glad to hear from any of my old friends who may be interested in this subject."

John Eppendorff writes: "I have not very much to report for this last year, 1931-1932. Buffalo has been as well favored during the depression as any of the cities in the country and in our own business we are finding quite a renewed interest, so that our sales in August were the only ones out of the 42 establishments reporting to the Federal Reserve, that went ahead of August, 1931. September is keeping up its own fairly well, and on cool, autumn-like days we get a proper response. I am sure that there is an awakening of interest in people to do something for themselves, and not allow the depression to affect them.

"It has been a hard year, of course, with every individual one of us with decreased salaries, and minus about one-half our regular investment income, but we are not worse off than others, so we have pulled through fairly well, in spite of our approaching Fiftieth Anniversary.

"I feel as young and active as ever, even though my household does not boast a radio, gramophone, or automobile! Some might consider me conservative and an Old Fogey, but as I am deeply interested just at the present time in writing a paper on the life and works



1883 Continued

of Frank Lloyd Wright, the most modern architect we have, I think I might be fairly considered one of the moderns.

"I also, in company with my daughter and son-in-law, took a five-day dash to Ogunquit on the Maine coast, to take in the total eclipse, which was very successfully seen from that point. Most of the friends of my age have said, 'I suppose you took the trip for the pleasure of the automobiling rather than for the eclipse.' On the contrary, even though I enjoyed every minute on the way to and from, the eclipse was more marvelous and awe-inspiring than I would have dreamed, and I feel that it was worth even a longer trip. We stood on a high point of land near Ogunquit, from which we had a perfect view of the entire horizon, and during the eclipse, as the darkness was spreading over the surrounding country, we were amazed during totality to observe the luminous, almost sunset effects of the clouds, all around the 360 degrees. It was due, of course, to the rays of the sun striking out from behind the moon on the far distant clouds, and was noted and spoken of by those who were in airplanes at the time. — I am looking forward with great pleasure to our Fiftieth Reunion and hope we shall have a good representation." — DAVID WESSON, *Secretary*, 111 South Mountain Avenue, Montclair, N. J.

#### 1885

When you meet Hugh MacRae at the Fiftieth Reunion you must remember to address him as Doctor, for his untiring, intelligent, and successful service in developing his plan of community farming has at last been recognized by the University of North Carolina which has recently conferred on him the honorary degree of Doctor of Laws. The citation which follows indicates the multiplex character of his interests and the energy and thought he has devoted to the development of his native state. "Hugh MacRae, son of New Hanover and graduate of Bingham and the Massachusetts Institute of Technology, we glimpse him on his way advancing from mining engineering to textile manufacturing, to the building of interconnected electric power systems across Cape Fear, Carolina, and finally to agriculture as basic to them all; organizer of home-owning farmers in successful rural communities; President of the North Carolina Conference for Social Service and founder of the Southeastern Economic Council; prophet of economic and social woes through agricultural decay but champion of scientific and community farming and coöperative marketing as the way of economic recovery, and interpreter of the farm as the chief economic resource of our social regeneration."

Royal Little, nephew of Arthur Little, was married on September 10 to Miss Augusta Willoughby Gage Ellis, of Philadelphia, at East Hampton, L. I. Mr. Little is a graduate of the Noble and Greenough school and Harvard University, Class of 1919. He is a member of the Institute of 1770, Hasty Pudding, Fox,

the Harvard Club of New York, The Country Club of Brookline, Rhode Island Country and Aviation Country Club of Long Island. He served overseas as first lieutenant in the 167th infantry, Rain-bow division, and now holds a commission as captain in the infantry reserve.

Robert Francis Fiske, son of Redington Fiske, was married to Miss Adelaide Sims, daughter of Admiral and Mrs. William S. Sims, at Newport, R. I., in July.

Under date of August 30 the following item appeared in the newspaper: "Edward Raymond Benton, widely-known retired architect, died yesterday at his home in Newton Center. He was born in Malden 81 years ago. He entered Harvard University with the Class of 1875, but due to illness gave up his studies. He later returned and took a post-graduate course and received his Ph.D. and A.M. degrees in 1878.

"In 1875 and 1876 he was assistant in the laboratory of the geological school and after a visit to Europe he became identified with the Agassiz Museum. He was in the division of mining geology of the United States Geological Survey and later, from July, 1881, to March, 1883, he was assistant professor of natural history at the University of Rochester. In June, 1885, he received his B.S. degree in architecture at M. I. T.

"Later he was in the offices of H. H. Richardson, Boston architects, and was also connected with the Boston office of McKim, Mead and White, New York architects. While with the latter firm, he took part in the construction of the Boston Public Library. From 1891 until his retirement 15 years ago he conducted his own business."

A letter was received by Ev Morss from Alex McKim in August stating that he had met Mrs. Boveri, née Marcella I. O'Grady. She had just taken her doctor's degree at the University of Berlin. She is head of the department of biology at Yale. Alex says he is arranging to be in this country on the occasion of our anniversary in 1935.

The sudden death of Fred Newell in Washington, July 5, was a great shock to the class. His notable work in the conception, organization, and administration of the Reclamation Service, his great interest in his Alma Mater, and his devotion to the Class leave a gap in our ranks deep and wide. As we are proud of his high character and his great accomplishments, so we mourn his loss.

The following memoir was prepared by his associate, Allen B. McDaniel '01: "Mr. Newell was born in Bradford, Pa., on March 5, 1862. His early education was obtained in the schools of Newton, Mass., where he was graduated from the Newton High School in June, 1881. Four years later he received the degree of bachelor of science in mining engineering from the M. I. T.

"After three years of field work in Colorado and other states, he was appointed on October 2, 1888, as assistant hydraulic engineer of the U. S. Geological Survey, being the first aid designated

under Major John W. Powell to investigate the extent to which the arid regions of the United States might be reclaimed by irrigation. He advanced steadily in this work, expanding its scope, and was successively made hydrographer and chief of the hydrographic branch. At this early period, Mr. Newell initiated and was in responsible charge of river flow, surveys and estimates of cost and capacity of reservoirs, investigations of ground waters, and other allied work.

"This preliminary work was directly succeeded by his work in the preparation and public presentation of various Congressional bills, one of which became the Reclamation Act of 1902. Immediately after that event, Mr. Newell was appointed chief engineer under Charles D. Walcott, then director of the U. S. Geological Survey.

"During the next few years the organization of the Reclamation Service was developed and plans outlined for extensive work in each of the western arid states, work being started in most of them. In 1907, when Mr. Walcott was made Secretary of the Smithsonian Institution, the Reclamation Service was organized as a separate bureau of the Department of the Interior, with Mr. Newell as director and Arthur P. Davis as chief engineer. Construction was rapidly pushed until 26 projects were completed in whole or part, notably the Roosevelt, Shoshone, Arrowrock Dams and the Gunnison Tunnel. While director of the Reclamation Service, Mr. Newell made several special surveys and investigations, notably a first-hand study of and report on the water resources of the Hawaiian Islands.

"The breadth of his interests and activities are indicated in his work as one of the founders and first Secretary of the National Geographic Society and also of the American Forestry Association. The early aim of both of these organizations was to arouse public interest in the proper conservation and utilization of our natural resources.

"The late President Roosevelt wrote of Mr. Newell, and his services during this period of his life, as follows: 'For 14 years I have followed at first hand the work of Mr. Frederick H. Newell. I speak from personal knowledge when I say that he was one of the most loyal, disinterested, and efficient public servants the United States had had throughout that period. I first came in touch with him when I was Governor, when I drew on him for aid and advice in formulating the proper conservation policy for the State of New York. During the years that I was President he was one of my right-hand men. It is too often the case in the United States that the men who are most prominent, who attract most attention, are inefficient or even vicious public servants, whereas the men who do the best work (I think, rather better than that done by the public servants of any other nation) pass almost unnoticed and without any adequate reward. Mr. Newell belongs to that small group. He is a public servant of whom it is the bald



1885 Continued

and literal truth to say that by his services he has made all good American citizens his debtors.'

'In July, 1914, as the result of the reorganization of the Reclamation Service he was made its consulting engineer. About this time he received the degree of doctor of engineering from the Case School of Applied Science.

'During the spring of 1915, Mr. Newell was invited to become head of the department of civil engineering of the University of Illinois. He succeeded the late Professor Ira O. Baker and reorganized and developed the civil engineering work over a period of five years. He also established an engineering library in the college of engineering during his stay at the University of Illinois.

'Mr. Newell early realized the need of wider acquaintance and greater cooperation among engineers. A conference in Chicago, called through his efforts, led to subsequent conferences in which about 100 societies were represented. The final outcome was the American Association of Engineers, dedicated to welfare work and encouraging engineers to become broader men and better citizens. He became its President in 1919 and under his active leadership the number of members increased rapidly from 4,000 to 16,000.

'In 1924, Mr. Newell cooperated with his friend, Allen B. McDaniel, in the organization of The Research Service, a group of consultants in various fields of engineering and construction, formed for the purpose of making researches and rendering service to states, municipalities, private concerns, and individuals. Up to the time of his sudden death, he was the President and at all times an active participator in the work of this agency.

'Mr. Newell's last piece of work was the editing and compilation of the book 'Planning and Building the City of Washington.' This work was the result of the coordinated contributions of 17 leaders of civic life in the nation's capital, and is the contribution of the Washington Society of Engineers to the Washington Bicentennial celebration. He was also the author of "Oil Well Drilling" (1888), "Hydrography of the Arid Regions" (1891), "Agriculture by Irrigation" (1894), "The Public Lands of the United States" (1895), "Irrigation in the United States" (1902), "Hawaii, Its Natural Resources" (1909), "Principles of Irrigation Engineering" (1913), among other books.

'His death occurred while he was engaged in some details of the work of the local committee on unemployment and public works of the Washington Society of Engineers and American Engineering Council.

'On the reverse side of the Cullum Gold Medal awarded to Mr. Newell by the American Geographical Society in 1918, is this inscription: 'He carried water from a mountain wilderness to turn the waste places of the desert into homes for freedom.'

'Mr. Newell was a member of the A.S.M.E.; Washington Academy of Science, of which he was Vice-President in 1907; Western Society of Engineers, and Illinois Society of Engineers. He had also served as a Member of the United States Land Commissions, United States Inland Waterways Commission, National Advisory Board for Fuels and Structural Materials, and the Illinois State Board of Examiners of Structural Engineers. He belonged to the Cosmos Club of Washington, D. C.

'He was married on April 3, 1900, to Effie Josephine Mackintosh, of Milton, Mass., who, with a son, John Mackintosh, and two daughters, Josephine and Constance, survives him.' — ISAAC W. LITCHFIELD, Secretary, Twin Ash Farm, Medfield, Mass.

### 1887

The Forty-Fifth Reunion of the Class was held at the Hotel Satuit, North Scituate, on June 11, 12, and 13, in which 16 members participated, the majority of whom were present during the entire time. On Saturday afternoon a number of the earlier arrivals enjoyed a round of golf, and by dinner time 11 of the faithful had reported for duty. These were joined by three on Sunday, and two more on Monday, on which latter night the Class Dinner was held. Sunday afternoon a fishing trip was arranged and was participated in by nine of the Class, the fishing grounds visited being several miles off shore, and the sea being somewhat rough. As two of the party were able to secure a good-sized cod apiece, the trip was voted a success.

On Monday forenoon the members motored over to Hingham Center to call on our classmate, Herbert M. Howes, who has been an invalid for several years, and who, needless to say, was delighted to see them once more. A call was also made on Frank Brett at his delightful home on Crooked Lane, North Duxbury. After the dinner on Monday evening Carter entertained the members with an illustrated account of his trip around the world in 1930, which was greatly enjoyed. Those attending the reunion were: President Taintor, Carter, Cushing (A. L.), Draper, Cameron, Cole, Proctor, Very, Lane, Moody, Whitney (G.), Coombs, Goss, Blake, Brainerd (W. H.), and Brett.

The following from the *Railway Age* will be of interest to members of the Class: "W. C. Cushing, formerly engineer of standards of the Pennsylvania Railroad, with headquarters at Philadelphia, who retired on May 31, after more than 44 years of railway service, was born at St. John, N. B., on March 18, 1863. After attending the University of New Brunswick (B.A., '84; M.A., '86) and M. I. T. (B.S. in Civil Engineering) he obtained his first position as a rodman in the engineering corps of the Jeffersonville, Madison and Indianapolis (now part of the Pennsylvania), serving in that capacity from 1887 to 1889. In the latter year he became engineer maintenance of way on the Cincinnati and Muskingum

Valley (now also part of the Pennsylvania), continuing as division engineer on the Pennsylvania from 1890 to January, 1901. For the next two years he served successively as superintendent of the Pennsylvania's Panhandle and Eastern divisions, being then appointed chief engineer maintenance of way of the Southwest System.

"In 1918 he took over the same position on the Pennsylvania Lines West of Pittsburgh, and in 1920 he was appointed engineer of standards. In this position, which he held at the time of his retirement, he was attached to the staff of the chief engineer, with jurisdiction over the standardization of practices and methods in the maintenance of track and roadway structures. Mr. Cushing was a charter member of the American Railway Engineering Association, and has served that association as a director, 1905-1917; as second Vice-President, 1909-1910; as first Vice-President, 1910-1911; as President, 1911-1912; and as chairman of various special committees and of the standing committee on rail. He was a delegate to three sessions of the International Railway Congress, and is a member of several national and international railway and engineering societies." — NATHANIEL T. VERY, Secretary, 66 Orne Street, Salem, Mass.

### 1889

Underhill died on June 4. The Boston *Transcript* carried the following sketch of his life: "Elks' services were held last evening at the Waterman Chapel, 495 Commonwealth Avenue, for William W. Underhill, Secretary-Treasurer of the Stone-Underhill Heating and Ventilating Company of Boston, and a partner and director of that firm, who died on Saturday at his home, 15 Kenwood Street, Brookline. Mr. Underhill was a life member of the Brookline Lodge of Elks, as well as a member of Beth-Horan Lodge of Masons, St. Paul's Royal Arch Chapter, Boston Council of Royal and Select Masters, Boston Commandery, Knights Templars, also of Massachusetts Consistory, 32nd degree Masons, Aleppo Temple, Ancient Arabic Order, and Nobles of the Mystic Shrine.

"Mr. Underhill was born in Winchester 67 years ago and had been a resident of Brookline for the past 35 years. He was a member of the Engineers Club, and of Harvard Church, Brookline, where he ushered for many years. He was past President of Harvard Church Brotherhood. Mr. Underhill is survived by his wife, Mrs. Elizabeth A. Underhill, his mother, Mrs. Lora Underhill, also of Brookline, a son, Earl W. Underhill, of Brookline, and three sisters, Mrs. Frank Peck of Brookline, Mrs. George Foster of Northfield, and Mrs. Charles Darling of Westbrook. — WALTER H. KILHAM, Secretary, 9 Park Street, Boston, Mass.

### 1891

Charlie Aiken writes of a visit with Walter Hopton in Syracuse. Charlie has spent most of the summer at his summer home at Franklin, N. H.

1891 Continued

Charlie Garrison is a good correspondent (referring to his letters to Barney). A recent one is headed, 37th anniversary, which is one year less than that claimed by your Secretary. We are getting to be "Ancients" if not "Honorables" (perhaps you are not familiar with this old Boston organization). Charlie writes: "Last summer was the warmest in 30 years, this one the coolest for some time. It suits us to a T. During the day, 60°-72°, cooler at night, and 74° the highest I have seen it. Fog part of every day and some days we don't see the sun at all. Sunkist? I should say not. You'll soon see them advertising fogkist products. No matter what they've got it's the best. I have given up swimming as the water is colder than I like. We still live on the fruits and vegetables. Yesterday I got 282 oranges for 35c at the packing house in Downey and in the evening squeezed 57 of them! We saw watermelons in L. A. yesterday for 5c each and good-sized ones two for 15c. But I don't care for them, for I'm a dry you know. We recently purchased 100 tomatoes for 20c and cantelopes at 2c each are common.

"A while ago we called on George Hooper in Pasadena. We saw his three children and the granddaughter. Unfortunately Mrs. Hooper was not at home. He has stayed at home this summer and not gone to Santa Barbara as usual and is enjoying seeing his friends. We have not been away much as we have had plenty to keep us busy here. There are two trips to our credit, one to Idylwild which I think I mentioned before, and last Saturday we went to see some cousins at El Cajon near San Diego. We went down the Coast to Oceanside and then back in the hills through a charming country where grapes and avocado were raised in large quantities. We were in the 'Ramona' country. We didn't see the town of Ramona as we had a 15-mile detour over one-way roads of dirt, up grades and down valleys, through a wilderness. We were in Bob's Auburn and I drove most of the way. After lunch with our relations, we returned through San Diego and the coast highway, stopping at La Jolla for ice cream for the children and ourselves. Our grands, four and two years, respectively, are perfect travelers, no matter how long the trip. This time it was 260 miles."

Will Bassett became Vice-President of the American Society for Testing Materials at the beginning of their fiscal year on June 24. George Hooper is another of our good correspondents and his letters are most interesting. "I am sending you some illustrated circulars of the beautiful spot which we chose for headquarters and where unexpectedly we met an old friend, Arthur Alley. We had intended calling upon some Utah friends at Coronado and also to look up Alley at National City, when to my surprise I found his name in the Del Mar directory and, on phoning, found him at home in his beach house within a mile or so of the hotel. He invited us to call at once so Mrs. Hooper and I went down and met him and his sister. They invited us to lunch with them at the Hotel at Rancho

Santa Fe, a high-class residential and country club development about 12 miles inland. After a pleasant meal they drove us about the country which is very pleasant and rolling, seems to have plenty of water, and is being developed for the raising of grapes and avocados — a very enjoyable day in excellent company. Arthur and I had many recollections in common of our '91 friends and thoroughly enjoyed talking over old times.

"Having heard much of the beauties and interest of 'Agua Caliente', the Mexican 'Monte Carlo', a short distance below the Mexican line, we spent a day there. The location is beautiful and large sums have been spent in landscaping the site and erecting artistic, spacious buildings. There are race tracks, for horses and dogs, and the inevitable gambling Casino, which includes an ample American Bar. Apparently the depression has had the same effect there as at other places as the race track and buildings looked as though they had not been used nor cared for for a couple of years and while quite a crowd assembled about lunch time, more than half of them were old country people who were sight-seeing and had no idea of risking their money, the games, while showing activity, being patronized principally, in my judgment, by 'cappers'. A large and very ornate building, known as a 'Fronton' to be used for the Cuban game of 'Jai Alai', a sort of court tennis, stands partly completed with all progress stopped on it.

"Charles Garrison and his wife were here about ten days ago, both looking very well, and I found on my return a cordial letter from Shattuck, who has not been very well but is now much improved."

Barney recently took an auto trip to Cape Cod, calling on John Putnam's daughters, having luncheon at the Joe Lincoln Inn and meeting Joseph Lincoln, the well-known author of Cape Cod stories. Barney says he has read most of Lincoln's books twice and some three times, to which he might add "go and do likewise".

Because of a misunderstanding, most of our recent notes were covered by the October number of The Review, together with the even-numbered classes. — HENRY A. FISKE, *Secretary*, Grinnell Company, 260 West Exchange Street, Providence, R. I. BARNARD CAPEN, *Assistant Secretary*, The Early Convalescent Home, Cohasset, Mass.

## 1893

Probably many members of the Class have not learned of the sudden death of Mrs. Mary Augusta Plumer, who was Fred Fay's secretary for 18 years. She died June 29 just as she was about to leave Boston for an extended visit to her son in China. Those of us who have had to do with class functions have long recognized Mrs. Plumer as the authority on all class affairs and members. Her personnel records are exemplary and up to date, and she was always alert to gather items of current news about members and their families.

The Thirtieth Anniversary Class Book, her most notable Class effort, is a publication distinctly creditable to any college class. For nearly three years she gave her time freely, largely outside of office hours, to the detailed work of gathering and verifying information, of compiling and editing, and of supervising printing and publication — a task whose magnitude can be appreciated only by one who has done such work. The class members who came in contact with Mrs. Plumer in their calls at the Secretary's office were impressed by her friendly courtesy and the genuine personal interest with which she met them. She was our guest on more than one occasion and was always introduced by Fred as "the real class secretary."

The Assistant Secretary, as well as Fred Fay, understands and appreciates how much she has done and the time she has saved us both. Ever loyal and devoted to the interests of '93, her passing is for the Class a very real loss. (G.B.G.)

Charles G. Waitt, for over 30 years actively associated with the Boston office of The Travelers Insurance Company, has been sojourning of late in Europe, principally in Praha (formerly Prague), Czechoslovakia, returning to Boston for a visit early last summer. The following extracts from a letter to a class member give a picture of his European experiences:

"I am here in Boston again, after spending many months in Bohemia and the Balkan states, principally in Praha and Karlovy Vary, Czechoslovakia. The East is faintly perceptible in Vienna; in Praha it is apparent — Cossack and Hun rub elbows on the street. It is a strange blending of the old with the very new. One steps from one of the more modern and bustling streets in which there are shops with huge plate glass windows, through an archway, into an ancient courtyard, leading perhaps to a narrow alley, with a whole cluster of old-world high roofs and picturesque buildings gathered around it.

"In exploring the by-streets of the city, one discovers some of the beautiful gardens — in summer ablaze with familiar and unfamiliar flowers — which are reached through huge archways, and lie quite unsuspected and invisible from the streets.

"The character of the State, its splendid past, and the present high level of its cultural prosperity, seem incorporated in Praha, admittedly one of the most charming cities of the world. Its venerable 'old town', with its labyrinth of Gothic and Baroque spires and towers, the broad Vitava with its green islands, and the white stone girdles of its bridges, the churches and noble mansions of the Mala Strana (small town), encircled by woods and grassy slopes, and dominated by the Royal Castle and the Cathedral of St. Vitus make it difficult to find an equally impressive panorama anywhere else in all the world.

"I am glad to be again in America, but I shall be more glad to return to Bohemia, for it is only by such contrasts that I can



1893 Continued

with any degree of clarity see Praha. It is made sharp in detail and dramatic by my different experiences and surroundings. Europe is very much like a spectacle on a gigantic stage. The old, long familiar shape of things is definitely breaking up, and we are viewing the last traces of historical Middle Europe, in which Czechoslovakia has a definite and strong part of the future — its people, the only reality of a nation, are vital and young and simple. All beginnings have taken their existence from simplicity.

"In Bohemia I am part of an existence that suits me exactly — the countryside is inimitably beautiful, its customs and people are familiar to me. Many years ago I spent many happy and carefree months with mother, who was there for her health and added years to her life. At that time I little thought that I would also be there for the same purpose.

"As stated above, I am at present in Boston, having temporarily given up my apartment at Zahrebska 50 in the Mala Strana district of Praha, but I expect to return in the near future and will then be glad to write you my new address, which will probably be the same. I shall also be glad to have the name of our compatriot who is teaching at Praha University, for it is pleasant to meet old Tech men so far away."

Frank P. Williams' cheery countenance will be recalled by many during our freshman and sophomore years when he was a special student with the Class preparatory to his course at the Harvard Medical School which led eventually to a distinguished medical career. He died June 18, 1932, and the following biographical account appeared in the Boston Evening Transcript of that date:

"Dr. Frank Percival Williams, long a leading figure in the medical profession, died this morning at his summer home on Kimball Street at Marblehead Neck. He had been gradually failing in health for a long time. To his intimate friends he was familiarly known as Dr. Percy Williams.

"Dr. Williams, whose winter home was at 15 Regent Circle Brookline, was born in Weymouth on September 2, 1870. His parents were Thomas Vickery Williams and Mary Ann (Healey) Williams. Following his course at the Weymouth High School, he entered the Institute of Technology and later the Harvard Medical School, where he received his M.D. degree in 1895. He then served as house officer of St. Elizabeth's Hospital, Brighton, and later filled a like position at the Post Graduate Hospital in New York, where he remained for 18 months.

"In 1897 Dr. Williams began private practice in Boston and became a specialist in his chosen work. He served on the staff of the Boston Dispensary and had been a professor in Tufts Medical School. Other professional service had been as captain and assistant surgeon, and later as surgeon general, in the medical department of the Massachusetts National Guard. He had been also examiner in Boston for the New York Life Insurance Company.

"He served overseas in the World War. As a lieutenant colonel of the Medical Corps and surgeon of the Massachusetts National Guard, he was called into Federal service in August, 1917, and was assigned to the headquarters of the 26th division. The next month he sailed for France, where he was detailed to the First Corps Schools at Gondrecourt, in February, 1918. His service under fire, while there, won him a citation from the British, for his bravery. Later, he was transferred to Camp Hospital No. 30, and was detailed to service in the Convalescent Camp, Mesves Hospital Center. From there Dr. Williams was transferred to Headquarters, 35th Division, in April, 1919, and later in that month he returned to the United States and received his discharge from service in May.

"Dr. Williams, who maintained professional offices at 483 Beacon Street, had been a member of the Massachusetts Medical Society, Boston Society of Medical Sciences, Boston Medical Library Association, the Brookline Medical Club, and other organizations. He belonged also to the Eastern Yacht Club and Corinthian Yacht Club, at Marblehead Neck; the Harvard Club and Algonquin Club, in Boston, and the Army and Navy Club in Washington, D. C. He had been a member also of the Boston Athletic Association and about ten years ago received a distinct honor in his election to membership in the United Sports Club in London, England. He was at the time of his death commanding officer of the 101st Medical Regiment.

"In 1900 Dr. Williams married, in Brookline, Marion Floyd Goodale, who died about ten years ago. By a second marriage Louise M. C. Phillips of Boston became his wife. She survives him."

The following recent changes of address are reported: John C. Hawley, 2301 Connecticut Avenue, N.W., Washington, D. C.; Charles H. Johnson, P. O. Box 665, Sarasota, Fla.; George Moore, Aqueduct Lane and Williams Street, Hastings-on-Hudson, N. Y.; George M. Yorke, 56 Seventh Avenue, New York City. — FREDERIC H. FAY, *Secretary*, 44 School Street, Boston, Mass. GEORGE B. GLIDDEN, *Assistant Secretary*, P. O. Box 1604, Boston, Mass.

### 1895

Much as we delight to tell each other of our joys and successes we are compelled at times to relate the passing of our members, one by one. Word is received through Frank C. Schmitz and John H. Gardiner, of New York City, of the untimely passing of Francis W. Belknap.

"Francis W. Belknap, President of the Phoenix Construction Company at 41 Park Row, New York City, died of a heart attack Thursday morning, September 22, in the emergency ward of the Pennsylvania Station a few minutes after he had collapsed there. Mr. Belknap, who lived at 224 Jamaica Avenue, Flushing, Queens, had just arrived from Flushing on a Long Island Railroad train and was walking to a subway entrance leading from the station when he was stricken.

"Mr. Belknap was 58 years old. He was born in Baltimore, the son of the late Commander Charles Belknap, of the United States Navy. After an engineering education at the Massachusetts Institute of Technology, from which he graduated in 1895, Mr. Belknap came to New York and was employed for some time by various firms. He later founded the Phoenix Construction Company with William Shannon.

"Among the well-known projects credited to Mr. Belknap were the Coney Island Boardwalk and the docks constructed at Bordeaux, France, during the World War. These were built to land American troops and, because of the emergency of the situation, had to be constructed in record time.

"Surviving are his wife, Mrs. Millicent Grant Belknap; three sons, Franklin P., Charles 2nd, and Donald F. G. Belknap; and two daughters, Miss Millicent F. Belknap and Miss Elizabeth Marin Belknap. Mr. Belknap's clubs included the University Club, the New York Yacht Club, and the Oakland Golf Club, and he was a member of the Loyal Legion." The funeral was held from his home in Flushing. A number of the New York '95 men attended. Just pause; our membership is one less.

John D. Moore is now associated with the New York Power Authority. This is a splendid and congenial assignment and bids to continue him in the public eye. We understand John was in Lewiston, Maine, recently and reports have it that "he saved the state for democracy." — LUTHER K. YODER, *Secretary*, Chandler Machine Company, Ayer, Mass. JOHN H. GARDINER, *Assistant Secretary*, Graybar Electric Company, Graybar Building, New York, N. Y.

### 1896

The editors never feel that The Review is fulfilling its mission if it does not refer at least once a year to the activities of Gene Hultman. He is continually in the public eye in Boston due to his activities as Police Commissioner, and the latest feature of his administration is the report from the Police Department after investigating the merits of the recipients of public aid from the Welfare Department. This report is in conflict with the Welfare Department. Earlier in the year Hultman submitted his annual report covering the calendar year 1931. Space limitations prevent a review of it here, but it was a model report, as evidenced by the favorable editorial in the Boston Herald, a paper which had not approved his administration as Police Commissioner.

Two reels of movies of our Thirty-Fifth Reunion at Osterville in 1931 have now been prepared and titles inserted. They are available for any classmates who wish to borrow them for a showing. We are indebted to Henry Jackson for putting through the arduous job of assembling these pictures and to Harry Tozier for getting titles inserted.

The Class of '96 is honored indirectly by having two freshmen on the Dean's Honor List, William R. Haseltine and



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William L. Root, Jr., sons, respectively, of Billy Haseltine of Ripon, Wis., and Bill Root of Pittsfield, Mass. Butler Ames favored the Secretary with a call in June. He is still pursuing his research on a novel method of propelling airplanes.

Frank Hersey reports that Jim Melliush is back from South America and has been threatening all summer to descend upon Boston. The very latest word from Frank was that the descent had not materialized but it was believed to be imminent.

Classmates will recall the previous report of favorable results of suit instituted by Joe Sturtevant against Henry Ford for injunction and damages on account of diversion of water at the old Wayside Inn in Sudbury. However, the final ruling by the full bench of the Massachusetts Supreme Court reversed the former decrees and nullified the damages. Apparently the injunction is dissolved as well, although newspaper reports disagree on this point. It seems unfortunate that Sturtevant's development of an unusual country place, and especially a bird and waterfowl refuge, should have come to this unsatisfactory ending.

Gurney Callan's daughter, Rosalie Dorothea, was married on Tuesday, July 26, in Cambridge, to Mr. Sven Anders Baekström. Dr. Coolidge's daughter, Elizabeth Belknap, was married to Mr. Frank Herschel Smith on Saturday, August 13, at Schenectady, N. Y. Mort Tuttle and Mrs. Tuttle announced the engagement of their daughter, Edith, to Francis Stone Wilson at a luncheon at their Newton home, June 14. Miss Tuttle graduated from the Winsor School in 1930 and then went to Smith College. Mr. Wilson graduated from Browne and Nichols in 1930 and is at present studying at Brown University.

Paul Litchfield was honored early in June when he received the award of the "Spirit of St. Louis" aeronautical medal at the sixth national technical aeronautic meeting in Buffalo. He thus makes the second recipient of this medal, the first bestowal being on Daniel Guggenheim in May, 1930. Considerable publicity has also been given to Litchfield's suggestion that American railways study the methods of European carriers, who are using Diesel driven, high-speed trains running on pneumatic tires to meet bus and truck competition.

It will be recalled that we reported last December the departure of Partridge from Boston with his dog, in his old car, on a camping and preaching tour through the country. Unfortunately his progress was not very rapid. The old car broke down several times on the road and he had to abandon it in Brooklyn. He was also laid up for several weeks by illness, and Guy Morrill reported early in the summer that he had finally reached Philadelphia, having secured another old car and finances enough for a new start. This second car had been fitted up with sleeping accommodations and Partridge carried a tent, so that he could camp out anywhere that he wished to stop on his ministry. Presumably he is still on his way accompanied by his dog. Guy Morrill said that he

himself was counting on attending our Fortieth Reunion four years hence, and had already begun to save up his pennies for it.

Julian Woodwell took advantage of the hold-up in business to go to the Wicker-sham Hospital in New York City early in June to have repair made of an ailment of nearly 30 years standing. This repair work was naturally more or less extensive, but Woody reported that the entries on his hospital charts showed nothing particularly eventful. He was out of the hospital by the middle of July, but was due to go slow for a considerable period until he was back to normal again. He has not built on his lot near Con Young at Bass River, Cape Cod, and his only deep-sea fishing this year had been two week-end trips out from Sheepshead Bay on a reconverted private yacht. However, they had two fine hauls of sea bass, black fish, and porgies.

Last April and May Con Young had two fishing trips, each of about a week, in the waters south of his winter home at Fort Myers, Fla. The detailed story is too long to reproduce here, and also to get the real thrill one should hear it from Con directly by word of mouth. They had their usual ups and downs of luck, which, in Con's case, were mostly down, until near the end of the first trip he got the thrill which comes only once in a lifetime, when he successfully landed a big tarpon, the final measurements of which were 6 feet 3 inches long and 2 feet 10 inches girth, with an estimated weight of 110 to 115 pounds. These are the figures reported by Con in his first letter in the latter part of April; but when the same fish was mentioned by him in a letter under date of June 15, the length had become 6 feet 5 inches, the girth 2 feet 11 inches, and the weight 125 pounds. It seems as if the final figures should go on record in order that the future may not show continuous growth of this fish with age. The Secretary has these final figures filed away together with two photographs of the fish. It is said that figures cannot lie, so it is to be presumed that pictures likewise cannot lie. Con's Florida season was apparently not all roses, in that he suffered from neuritis, rheumatism, and depressed dividends during the winter. However, warm weather in April limbered him up so that he was able to put over two musical recitals. The newspaper announcement spoke of one of them as a "benefit musicale and garden party" featuring Conrad H. Young of Washington, a concert and radio artist who sang a group of songs. Apparently Con was a good attraction, as the Edison Park Community Church of Fort Myers, Fla., was \$100.00 better off from the proceeds of the show.

Belated report has been received of the death of Rudolf Hesse who was a classmate in Course X in the years 1894-95. Information regarding him is very meager. Our records show that he was born October 11, 1871, and was the son of Aug E. Hesse of Sebnitz, Saxony. The only address we have ever had for him was 318 Bohmische Strasse, Sebnitz, and

it is understood that he was living there at the time of his death, March 1, 1929. The Secretary has written to Lindenlaub to try to get further details if possible.

We were all shocked at the death of George Burgess, which occurred July 2, in an ambulance, after he had been stricken suddenly in his office and was *en route* to the hospital. This was the second attack, the first having occurred on October 28, 1931, at a meeting of the Bureau Chiefs, but he seemed to have recovered fairly well from this first attack. Newspaper reports stated that Burgess had been very much worried over the necessity of curtailing his operations and budget and dismissing employees as a result of the economy program of Congress, and even at the time he was stricken he was discussing the situation with several officials. Burgess and his work are so well known and, furthermore, newspaper accounts at the time of his death were so complete that classmates must be fully informed and a biography of him here would be only repetition. Briefly, he was born in Newton, Mass., January 4, 1874. He taught at Technology and studied at the University of Paris, receiving the degree of Sc.D. in 1901. While in Paris he married Susanne Babut. There were no children. He had teaching experience also at the University of Michigan before entering the U. S. Bureau of Standards as Associate Physicist in 1903. He did notable work in metallurgy and pyrometry, and was the author of many papers and articles, and instituted many valuable investigations. He was felt to be the logical man to succeed Dr. S. W. Stratton as Director when Dr. Stratton came to the presidency of Technology. Burgess was a member of many societies and organizations. The Secretary recalls with pleasure the trip to Japan in 1929 when he and Burgess attended the World Engineering Congress and had opportunity to renew old friendship while on the boat, and also in Japan. All of us who were at the reunion in Osterville in 1931 will treasure the memory of Burgess's presence with us there, the first reunion that he had been able to attend, but he promised us that it would not be the last if he could help it. A number of the classmates have written in to the Secretary giving expression to their deep feeling over the death of Burgess.

The Fullers arrived back home in Brockton early in the summer after their seven months' trip. Their travelogue, however, is not yet complete, and here is another installment. It will be recalled that we left them at Dahomey, whence they were headed for Lagos, the capital of Nigeria. This was their last stop on the once infamous slave coast. "Lagos is now a modern port (British) with long freight piers, fine public buildings, and a handsome bund with attractive bungalows, masking, however, a crowded native section of small crude shops and open markets. Here we added to our American gasoline, which we have been landing by hundreds of tons all along the coast, a

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supply of Shell gas from Venezuela, which we will likewise distribute in ports to the south.

"The New Year was ushered in by a prolonged blast of the ship's whistle, as we were off Oil River, named for its palm oil. Owing to our cargo of gasoline, we had to dispense with the usual fireworks, but the crew made up by 'singing.' Whatever tune they started, from 'In the Good Old Summer Time' to 'Merrily We Roll Along,' all trailed off into 'Nobody Knows How Dry I Am.' The excruciating discords belied the latter words, however, as did the heavy drain on coffee and the ship's fresh water supply on the morning after. The native ship's boys greeted us with 'Dash me.' We wondered whether we should hit them or what we should do, but eventually awoke to the fact that it was the African demand for a New Year's tip, a relic of the old trading days when presents were always made before business was attempted. In the forenoon, trolling from the ship's stern, we caught a five-foot barracuda, weighing some 35 pounds. Our cook welcomed it as a change of chop, as food is called along the coast, but when the fourth similar fish was taken to him he said, 'Throw it overboard.' The native boys rescued it, however.

"On the morning of January 2 we put into Victoria in the British Cameroons, taken from Germany in the World War. It is the most picturesque spot on the whole West African coast, with the great volcanic mass of Mount Cameroon rising behind the town to a height of 13,500 feet, nearly as high as Pikes Peak. The same day we called at the Spanish Island of Fernando Po, some 25 miles to the south, with another dark massive volcanic mountain rising to 10,000 feet.

"January 3 found us wasting a day at anchor in the Cameroons river, as the French pilot would not come down on Sunday. As the operating of our steamer amounts to some \$500 per day, the forcibly expressed irritation of our captain was certainly to be excused. Near us projected several of the masts of six ships sunk by the Germans, then holding the Cameroons, in an ineffectual attempt to block the channel to the British and French.

"The following morning we made the remaining 15 miles to Duala, now the capital of the conquered French Cameroons. Built by the Germans, however, it has broad and shady streets, with handsome buildings set in large grounds, with winding paths, palms, and flowers.

"Today, January 5, we are at Kribi, also in French Cameroon, being anchored nearly two miles off shore owing to shallow water. The town, mostly hidden from the sea, lies in a little land-locked harbor, invisible until one is in its mouth and available only to small boats. It is a picturesque spot, overhung with palms and giant breadfruit trees shading native huts of thatch or matting, with a foaming river cascading into its head.

"From the Cameroons we continued lazily down the West African coast past Rio Muni, or Spanish Guinea, to the

French Colony of Gabon. Strangely, as we neared the equator, we left behind the steaming, sticky heat of the Ivory, Gold, and Slave Coasts of the north side of the Gulf of Guinea, the temperature dropping to 80 degrees and the air becoming drier. Coats were even put on in the evenings, the first time for weeks. The line was crossed without notice, the Neptune ceremony of former days being abandoned because of the 'rough-house' which usually followed, and in which the sailors too frequently got even with any officer who was not popular. It was our seventh crossing.

"About 100 miles south of the equator we passed beyond the limit of the 'big rains,' the high, thick, tropical jungle giving place within a few miles to brush, and a little farther to green, grassy slopes resembling those of parts of New England. At the same time hills began to appear, a welcome relief after the endless low forests we had seen day after day for hundreds of miles.

"Our first stop in Gabon was at Libreville, from the vicinity of which Paul du Chaillu made the famous trip on which gorillas were first discovered. Within sight of the city is the mouth of the Ogowe river, which, with the labyrinth of channels, lagoons, and lakes extending southeastward to Samba Falls, has recently been made famous by 'Trader Horn.' The old firm which he worked for still has offices in the coast towns, and many of the 'factories' or trading stations are yet in existence. We caught enough fish by trolling from the stern to keep the ship supplied. The last, a 30-pound barracuda, was unusually plump, but our native boys, with an eye to 'chop' for themselves, said 'Plenty much water. No good.' We persisted in investigating, however, and found a big roe — and we, not the boys, came in for a feast. From the Portuguese port of Loanda in Angola, our farthest point south on the West African coast, we went north a day's run and entered the Congo river, seven miles wide at its mouth and second only to the Amazon in volume.

"For some miles our ship twisted in and out through a network of channels between jungle-covered islands, with now and then a big crocodile basking in some open spot. This is one of the worst haunts of the tsetse fly, over 40% of the natives being afflicted with the resulting sleeping sickness. The fly is about three-quarters of an inch long and crosses its wings scissor-fashion on alighting. It is found only in forests or shady spots, never in large clearings or on the savannahs. It always attacks from the under side, and is quick of movement and difficult to kill without some kind of a swatter.

"Above the forest belt on the river comes a stretch of savannahs in which, the tsetse fly being absent, cattle thrive. Then the Crystal mountains are entered, really big rolling grassy hills with a tree here and there. We anchored on our first night on the river near Boma, the former capital of Belgian Congo, at the entrance to the hills, but with a broad marsh on

one side, and were devoured by mosquitoes. Coming as they did from uninhabited savannahs we trusted that they were not bearers of fever. The following day we made only 30 miles against the strong current, then anchored for the night. On the morning of January 15 we tackled the dreaded Devil's Cauldron, a sort of whirlpool between 800-foot cliffs, with a current of 10 miles an hour. As we could only make 12 miles, it was almost foot by foot that we made the ascent.

"At Matadi, just above, we left the ship, which had been our home for 45 days. The town is on a steep side hill and one almost needs a ladder to get from one building to the next above. The streets ascend in zigzags. To our surprise we found a modern hotel with elevators, baths, and even a roof garden. From here we make our start across Africa to the Indian Ocean." — CHARLES E. LOCKE, Secretary, Room 8-109, M. I. T., Cambridge, Mass. JOHN A. ROCKWELL, Assistant Secretary, 24 Garden Street, Cambridge, Mass.

## 1899

A secretary, according to Webster, is "a confidant — one entrusted with secrets." This is becoming an obsolete occupation for a secretary, I assure you, because I have been entrusted with none of the secrets of the members of the Class of '99.

Looking further, I find that "a secretary is a person whose duty it is to oversee the affairs of an association, a public body, or an individual." The Class of '99 is certainly an association with a President, Secretary-Treasurer, by-laws, and a minute balance in the bank. It is happily a solvent concern in these "depression" days and should have affairs of a sort, but does not. As a body, it seems to be dormant. The individual members, I fear, suffer from undue modesty and few of them will give me any information about themselves. Churchill, of Berea, Ky., is this month the sole exception. He has invented something new in connection with the art of weaving, and he has invited me out to see his invention in operation. At the moment I cannot go and I shall ask him for more details.

In response to a recent plea addressed to Norman Rood, he told me he had nothing to contribute to the news column because he had stayed at home all summer. In the next sentence he informed me that he had practically recovered from the automobile accident of a couple of years ago. I interpreted this as an excellent piece of news. When one is getting better in either health or fortune, it is front page news in these parlous times.

C. B. Cluff of Cincinnati, Ohio, was in Washington a few days during the last week in August and called on me. We had a chat for old times' sake and a game of golf. He then went on his way and since that time I have neither seen nor heard from any member of the Class.

As Secretary-Treasurer, I contemplate spending the remaining balance in the bank, minute though it may be, to put on



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a news collection campaign in order that our standing in the Nine-Issue Club shall not be imperiled. As an economy measure, can you not each and every one take this hint and drop me a line about yourself or some other member of '99? This would have a threefold meritorious effect: it would save our bank balance; it would save our reputation and our standing in the Nine-Issue Club; and it would save your Secretary from tampering with the eternal verities. — W. MALCOLM CORSE, Secretary, 810-18th Street, Washington, D. C. Arthur H. Brown, Assistant Secretary, 53 State Street, Boston, Mass.

## 1900

At the annual dinner about the usual number turned up to round out a table. The following being present: Mr. and Mrs. C. E. Smith, Mr. and Mrs. I. Bowditch, Mortimer Silverman and his sister, and Sperry, Ziegler, and Fitch.

Doug Everett, playing on the U. S. Olympic Hockey Team in the tryout series at Lake Placid last winter, made the first goal for U. S. and later in the series shot the last goal — quite an honor for the son of our old ball player.

We regret to announce that during the spring, three of our Class passed away. They were: Charles A. Barton, VI, at 1216 Chestnut Avenue, Willmette, Ill., on January 3; Lucius W. Godfrey, at 4130 Sunset Road, San Diego, Calif., on April 6; and Albert G. A. Schmidt, II, at 1302 Argyle Street, Chicago, on April 18.

A letter from Sperry states that he is now with the Washington Gas Light Company in Washington, D. C.

The *Railway Age* of July 23 published an interesting letter to President Hoover by Mortimer Silverman proposing that the railroads sell their freight equipment to a Government-sponsored corporation and then rent it on a *per diem* basis as a means of keeping them out of their financial difficulties. Commissioner Eastman of the Interstate Commerce Commission believed the plan merited consideration. Mortimer was formerly assistant to the President of the Boston and Maine Railroad.

This summer we have been able to locate several members of the Class whose names were in the list of "no known address." Arthur M. Constantine, IX, is now in Mexico City, Edificio Condesa D-4 — still in the newspaper business; Frederick M. Delesdernier, 151 Lamartine Street, Jamaica Plain, Mass.; Edmund H. Durgin, 3201 Mountain Avenue, El Paso, Texas; David A. Ellis, 88 Washington Street, Norwood, Mass.; Paul J. Ober, 423 Ward Street, Newton, Mass. (business address: 85 Devonshire Street, Boston); Lawrence W. Jenkins, the Peabody Museum, Salem, Mass.; and Frederick C. Lindsley, 5665 Royal Street, Oakland, Calif. — C. BURTON COTTING, Secretary, 111 Devonshire Street, Boston, Mass.

## 1901

While I am still a-setting on my Vermont hill top, the time for departure draws near. And may I once again remind my classmates that when I get back to

Boston I am to be found at the address given below and that there is a warm welcome awaiting any visiting fireman. I hope the tactful appropriateness of that last phrase may appeal.

In the meantime, reports are coming in of past and present doings of our group. I quote from a letter just received from Carl Johnson, which shows that all of the honey in life is not sipped by the wandering oil geologist — though God knows, he gets his share.

"Recently completed a flying trip of more than 10,000 miles around the North American Continent with Senator Young of California as my passenger. Flight occupied nearly two months during which 65 landings were made, one being a forced landing near Mexico City. Had no trouble with plane or engine. Have a Ryan six-place ship with a Pratt and Whitney 'Wasp' motor hopped up to 550 H.P.

"Leaving Los Angeles, I flew down the west coast of Mexico to Mazatlan, then over to Guadalajara and Mexico City over miles of jungle and mountain where a forced landing would have been disastrous. Then to San Antonio and New Orleans over the Louisiana marsh country. Over Florida and up the Atlantic Coast to New York, stopping at all big cities on the way. Next to Hartford for an inspection of the Pratt and Whitney factory, then Albany and over Lakes George and Champlain to Montreal.

"Ottawa and Toronto, at which latter place we were delayed by bad weather for six days after flying from Ottawa in a blinding rain. Back to U. S. A. at Detroit and on to Chicago and Milwaukee. St. Paul and forced down by fog and rain at Watertown, S. D. Miles City, Mont., and down at Helena on account of storms over the mountains. At Missoula four days were spent after twice attempting to cross the mountains to the west and getting into snow storms and ice forming on the wings. Spokane and Seattle, then down the Pacific Coast to Portland, Eugene (Wash.), Reno (Nev.), and Los Angeles. The last day was the toughest. (Husualyis, A. W. R.). Heavy gales and rough flying. Fog over Los Angeles forced me to go back to the desert where it was clear and set the ship down in a heavy gale, making it necessary to lash the ship down to keep her from blowing away till the weather over Los Angeles cleared.

"Have now covered 44 States of the Union and crossed the Continent by five different routes."

Incidentally, Carl must be some little flier. I hope you will pass over without comment his unconscious disloyalty to the tradition of "the garden of America, where the sun always smiles" — presumably 24 hours a day — Hollywood doing its bit.

I was in New York a few weeks ago to give a paper at the International Eugenics Congress. Fancy the thrill which was mine, even though current mores render it vicarious, when I received the following proud record from Lammot du Pont: daughters married, 3; daughters engaged,

1; sons married, 1; sons engaged, 1; grandchildren, 3, 2 boys and 1 girl. And in addition, there are two sons and one daughter who have not yet committed themselves. I offer this proud record — and it certainly is one — in the hope that I may receive glad tidings of a like nature from others in the Class who have presumably guaranteed a continuance of our eugenic civilization.

And comes a hail from another wanderer; namely, Beckwith, who writes himself down as "retired" — Carl Johnson does, too; there is something mysterious about this — and who participated in the Mt. McKinley Cosmic Ray Expedition this spring and later continued observations with Prof. R. D. Bennett of the Institute at Kennicott, Alaska. I wished that he'd been a little more expansive about the details, which are certain to be interesting, but I presume that these retiring physicists — like Millikan — shun the garish light of day and hide their good deeds in page-long differential equations, beside which the occult notations of Albertus Magnus and the proud author of "The Triumphal Chariot of Antimony" are alphabetical. Anyhow, Beckwith conceded the fact to his palpitating public, and if this chances to catch his eye, he may send me a bit more of the dope in recognition of my reticence — and discretion.

By the way, this is an open season on the missing, and I entertain high hopes of bagging a few. Matt Brush gives me a hot lead on Leonardo Hering and that "Kim" of our freshman year, John Stannard Bronson. Bill Farnham puts Blauvelt of the same ilk in the retired class and fixes him at Hingham, where I hope to run him to earth in his retirement. Nat Patch writes me that William Thomas Lane is in Tulsa, Okla. — one of the way stations, by the way, of our peripatetic LeBosquet. And Fred Clapp thinks that Walter Dillaby Pratt lived near him at one time. While this seems highly probable — with Fred's restlessness, we all must have at some time or other — it doesn't help much to place Walter at the present moment.

But with the reunion drawing on apace — next June, remember — it is highly desirable that we round up as many of the missing as may be and invite them to partake of the calves that Mat Cushing and Phil Moore have been fattening for years and years at their respective ranches in anticipation of this glad event. Somehow, life would be fuller of meaning for me if I once could see again he whom Freddy Boyd, with a fine ornithological touch, always insisted on calling "young Ross Redsucker."

Finally, I received not long ago from Fred Freeman, now yclept Bill, a little map which I regret I cannot reproduce for the benefit of the faithful. Write to Bill for one and put it in your purse — it will be so encouraging to have something there again — and if you are in the neighborhood of Casco Bay, follow directions. This is one bet that Fred Clapp has missed so far. But he won't. There is oil (fusel) at the end of the



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rainbow. Also, Bill has his own ideas about cosmic rays and will be glad to exchange neutrons or fragments of long dead worlds with any other serious collector. And Bill heaves a mean brick.

My next letter will be dated from Boston, I'll be there and — well, you know you'll be mighty welcome. — ALLAN WINTER ROWE, *Secretary*, 4 Newbury Street, Boston, Mass.

## 1903

A. A. Potter, Dean of Engineering, Purdue University, has been nominated for President of the American Society of Mechanical Engineers for next year. — Myron Clark, Vice-President of the Reading Iron Company, presented a paper, entitled "The Development and Application of Standards to Productive Management," before a meeting of the Taylor Society in New York City, which received very favorable and complimentary comment.

The spring reunion of the Class was held at the home of the Secretary, F. A. Eustis, on June 11, and was attended by the following: Mr. and Mrs. Ralph H. Nutter, Mr. and Mrs. H. H. Fales, Mr. and Mrs. L. B. Gould and three children, Mr. and Mrs. C. M. Joyce, R. F. Jackson, Harry A. Stiles, Mrs. George Greene, Mr. and Mrs. A. H. Eustis. Baseball, swimming, and renewal of acquaintances occupied all during the afternoon, and after supper messages were read from F. W. Davis, H. R. Low, K. D. Jewett, G. H. Garcelon, W. H. Whitcomb, and I. F. Atwood. Although not many members can attend at any one reunion, it seems that one or two new faces are seen every time, and it is the hope of the secretaries that the time may come when every one will take it into his head to attend at the same time.

The sympathy of the Class is extended to George Bradshaw, whose wife died last July.

H. S. Morse sends in a bit of news occasionally, for which we are grateful, and we have heard from R. A. Cook. — Cushman was reelected the class representative on the Alumni Council, and would be only too glad to write a personal letter to any member desiring to know what the Council does or what is new at the Institute. — FREDERIC A. EUSTIS, *Secretary*, 131 State Street, Boston, Mass. JAMES A. CUSHMAN, *Assistant Secretary*, 89 Broad Street, Boston, Mass.

## 1904

The Annual Class Reunion was held as usual at East Bay Lodge, Osterville, on June 24, 25, and 26, and was attended by 12 of the faithful, the roster being as follows: Mert Emerson, Harry Kendall, Hump Haley, Gus Munster, Bob Dennie, Phil Sweetser, Cy Ferris, Herb Goddard, Mrs. Goddard, Gene Russell, General Holcombe, and me. There is not much to be reported regarding the Reunion as nothing outstanding occurred. The usual amount of golf was played but the records have been lost. All those present enjoyed themselves every minute and felt very sorry for those who were unable to come.

Don Galusha replied to the notice of the Reunion with the following letter: "This may be old stuff to you. It came out in a last year's aviation magazine I recently ran across. Thought I had the name and date but do not find it.

"My daughter Elizabeth and I are just starting for Portland, Ore., to visit my mother. Going by motor and expect to visit Alaska before returning in September in time for school.

"Best regards to you and the fellows at the Reunion which I judge will be as per usual."

The "old stuff" to which he refers was a clipping about none other than our famous classmate Volts Ovington which is pretty well written and worthy of inclusion here.

"It never occurred to me until this minute, of course, but I just happened to think that this Cleveland Air Police has all the earmarks of a publicity stunt perpetrated by the nimble-witted Cliff Henderson to advertise the National Air Races. I don't suggest for a minute that this really is a publicity stunt.

"However, if it really is a publicity stunt — as, of course, it isn't — why not make it amount to something by having the whole Force hop on to and arrest this notorious character from the Far West, whose picture I publish herewith for identification purposes. This hard-boiled old egg is the first United States air mail pilot, he has been flying since 1911 — and he is still flying. These are reasons enough alone why he should be juggled.

"In this photograph we catch him in a disguise he sometimes affects — that of an honest old cattle rancher, which he isn't. Actually, he's a real estate subdivider, so probably the less said about his honesty the better. He writes me: 'Guess I've got my old job again this year — herding the girls across the continent in the women's derby as starter and timer. Nice bunch of girls last year, and think there will be this year. They choose old birds like me for this job — one foot in the grave and the other on a banana peel.'

"Which is true enough, girls. But there's no telling which way that other old foot on the banana skin is going to slip — you want to remember that. This old girl herder from away back is called, among other things, Earle Ovington. He and the climate are the most famous things in Santa Barbara, Calif."

The photograph referred to depicts Volts in a typical rancher costume with a ten-gallon hat and a red handkerchief tied around his neck. It is really too bad that the photograph cannot be reproduced here.

A clipping from a Quincy, Mass., newspaper dated June 24 carried the following headline on the front page: "PICK HOMER AT NEIGHBORHOOD CLUB ELECTION," and goes on to state: "Charles L. Homer was elected President of the Neighborhood Club by a vote of the Board of Governors at the annual dinner meeting held at the Club House last night." This seems to indicate that Charlie is still gathering in the honors as

he used to do when we were at the Institute. The clipping was accompanied by a very recognizable portrait of Charlie, although it looks slightly different from photographs taken in earlier life because in this picture the front margin of his forehead has retreated over the top and is now out of sight somewhere in the background of the picture. This need not cause Charlie any worry because there are many of us who are rapidly approaching the same appearance.

I have received a card announcing the fact that the Boston office of Comstock and Wescott, Inc., formerly in the Chamber of Commerce Building, has been moved to its research laboratory at 179 Fifth St., Cambridge, Mass., so if any one wishes to call on Dan they will find him at the new address.

A. D. Smith was in Boston recently and dropped in to see me for a few moments. He was on his way to Chicago after having spent a vacation in the Canadian Maritime Provinces. During the past years his business connections with the oil industry have taken him practically all over the world and he was anticipating another trip to foreign shores before a great while.

It again becomes my sad duty to record the passing of three of our classmates. Joseph L. Lovett died on May 20, 1931, in accordance with a card which I received as a result of the notices for the Annual Reunion this year. — Herman R. Simmons died at Peacedale, R. I., on April 8. — The following clipping from the Boston *Post* of May 29 records the death of William H. Foster.

"William Houghton Foster, private secretary to former Governor Fuller, died yesterday at his home, 3 Hartley Terrace, Brighton, after a lengthy illness.

"He was 50, and a graduate of Massachusetts Institute of Technology, with the class of '04. During the war he served with the Red Cross.

"He was born in Chelsea. He was married to the former Miss Evelyn Pigeon of that city. Besides his wife, he is survived by a son, William H., Jr., by a daughter, Mrs. Evelyn Rogers of New York City, and by one grandson."

This constitutes all the items I have received with reference to classmates. I hope that some of those who read these notes may feel an urge to communicate with me, giving me any information which may come to their knowledge in order that I may have something to put in the next issue. — HENRY W. STEVENS, *Secretary*, 12 Garrison Street, Chestnut Hill, Mass. AMASA M. HOLCOMBE, *Assistant Secretary*, 3305-18th Street, N. W., Washington, D. C.

## 1905

It was Billy Ball's son who came to Wesleyan with the Tech track team last spring and inquired for your Secretary. Billy writes: "Bill, Jr., made some inquiries for you, as I told him you were located at Wesleyan, but he failed to connect. I saw the interclass games at Tech Wednesday afternoon, in which he finished third in the 100-yard dash, fourth

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in the 220, and second in the broad jump. The Class of 1934, of which Bill is a member, won the meet by a big margin. Tech is sending Dick Bell and Kearns, both '34, to the I.C. 4-A meet in Los Angeles this summer.

"Monday, the 16th, Carl Danforth and his wife, accompanied by two friends, arrived from Bangor. They were on their way to Washington, where Carl and his friend were sent as delegates to the convention of the Masonic Clubs of the U. S. The principal work in hand was the dedication of the New Washington Memorial at Alexandria. Wife and I spent a very enjoyable week with them last summer at their camp on the Penobscot River at Hampden. It rained every day but you cannot kill the '05 exuberance with a little rain.

"Attended a golf outing of the Factory Mutuals on Monday, the 23rd, which was held at the Sandy Burr C. C. Ed Barrier was there, too, and swung a mean niblick along with the rest of us. Ed is fast rounding into shape and should be hot stuff by the time the big reunion rolls around and we hit the trail for Oyster Harbors."

Charlie Clapp, President of the University of Montana, gave the Sigma-Xi, Phi Beta Kappa address on June 10 at the University of Washington. His subject was the "Origin of the Rocky Mountains as Read in the Inland Empire." This item came from Professor Locke so the title doubtless means something to the men of III and XII. Ben Lindsly's two children graduated from the University of Oklahoma in June. Bob had taken petroleum engineering and stepped right into a job. Martha, in Arts and Science, was high score on the Women's Rifle Team and won ribbons at the Horse Show, specializing in jumping. — Daniel Hine has been located in Eastford, Conn., where he has asked your Secretary to stop and hunt him up. He says: "Don't know as you'll find me home but stop and see anyhow." — Grafton Perkins' daughter, Deborah, has entered Smith. Grafton, Jr., has completed a year at Annapolis. — Ros Davis' son, Dane, is a freshman at Princeton.

Tom Estabrook wrote Ros Davis in June: "The second of March I had one of those nervous collapses and after two weeks in bed the good old doc said 'Bermuda.' We started the 16th from New York and at 9 o'clock the 17th ran into a storm which stayed with us for about 20 hours — and *what* a storm! I've been around the salt water all my life but I've never seen anything like I saw then! We have a man here that has made the Bermuda race and after seeing the height of the seas off Bermuda and thinking what it would be like if you just *happened* to run into one of those bad blows, I am filled with respect!

"Of course I suppose a small boat will ride 'em much easier than a 30,000-ton liner — surely the fishermen on the Banks get theirs just as much as anyone, and don't mind it, but I should think sailing a light racing boat through such weather would be akin to a cross between bronchobusting and Swiss-bell ringing!

"Shall watch the papers for your progress in the Bermuda Race — and wish you luck — boy, if you catch what my fishermen friends call an 'unlucky sea' you'll need *some* luck!"

Ros says that he did not need "some luck" although the going, all the way down, was bad. "We had five days of heavy head wind and sea and were pretty well shaken up, or down, when we made St. David's Head. I was again on *Duckling*, 37-foot, jib-headed sloop which won the Cape May Ocean Race in '31. The big thrill came before dawn the first morning out when a distress flare was seen ahead. An hour later we were standing by at the burning of *Adriana*, a large schooner, a competitor in the race. Although we had seen another yacht, in the semi-darkness, near the *Adriana* and guessed that she had taken off the crew, we were not sure and, of course, sailed around for an hour or two on the chance of picking up somebody. Fortunately, there was nothing for us to do and we continued the race. But it was an experience that I do not care to repeat.

"This year we ran into St. George's, more interesting, I thought, than Hamilton. After two days in which we got dried out and had one night in a clean, quiet bed, we sailed up to Hamilton. At dinner in Paget, a fellow guest was Harry Pigeon who sailed his 30-foot yawl single-handed around the world a few years ago and was then on his way to California via Panama Canal. Extremely modest, when drawn out, he told interesting tales of his long voyage. Another guest had spent nearly all her life, with her family, the only whites, on a tiny island in the Caribbean where the only industry is making salt from sea water and the only communication with the world by an occasional steamer or the sailing packet to Jamaica 400 miles away. Visiting, she said, was more exciting than staying at home.

"At the Royal Bermuda Yacht Club I saw Hub Kenway's son, a student at Yale and one of the crew of a Boston schooner in the race. Charlie Bogg's *Black Goose* was at New London and Cortlandt Babcock's *Sea Witch* sailed down, but these classmates were not discovered.

"The return trip was enlivened by a talk with a Coast Guard vessel, less than 200 miles from Bermuda. She was searching for the missing yacht *Curlew*. The same day we were surprised to see an airship far ahead. She saw us and passed almost directly overhead. It was the *Akron*, also looking for *Curlew*. Early the next morning, the *Monarch of Bermuda* altered her course and passed close by. A view of a steamer at sea and so close is unusual.

"Around midnight, Montauk was sighted dead ahead and in a few hours we were in the calm waters of Long Island Sound and the ocean voyage was over. In our crew as cook, and he was a good one, was Bob Rand '07, brother-in-law of Ben Lindsly, whom I had not seen since Technology days. In the spring of '05 we were both sailors in *The Chemical Maid* and here we were, after all these years,

again shipmates. It was a mighty pleasant reunion." — ROSWELL DAVIS, *Secretary*, Wes Station, Middletown, Conn. SIDNEY T. STRICKLAND, *Assistant Secretary*, 20 Newbury Street, Boston, Mass.

## 1907

The Boston *Herald* of September 1 contained the following news item in its financial page: William H. Coburn and Company, investment counsellors, 68 Devonshire Street, announce that Donald G. Robbins has joined their staff of investment counsel. Mr. Robbins for the past 12 years was associated with Hornblower and Weeks where he was in charge of their statistical and engineering departments. He is a member of the Alumni Council of the M.I.T., and has just completed a two-year term as Vice-President of the Technology Alumni Association. More recently, Mr. Robbins has been devoting his entire time to the National Economy League, as Vice-Chairman of the Boston committee." Don lives at 19 Ridge Road, Waban, Mass., and has two sons.

Word has been received from a law office in San Antonio, Texas, that Willis Ranney of our class died a violent death on July 16. We shall try to secure more facts to publish in the next issue of The Review.

Frederick W. Amadon is senior civil engineer with the Interstate Commerce Commission with office at 1901 D St., N. W., Washington, D. C. He had hoped to attend our Twenty-Fifth Reunion in June, but wrote that at that time he would be riding a gasoline motor car over the ties between New York and Buffalo on the Lehigh Valley Railroad on a depreciation inspection. Fred is married and has a son 17 years old and a daughter 14.

Albert L. Burwell writes that after engaging in the various oil ventures between 1921 and 1930, he was crippled in an accident which happened in September, 1930, and since then has been unable to do any work. He is married and, with two sons, lives at 953 East 36th Place, Tulsa, Okla.

Addison Miller, II, wrote the following letter in June: "It is with extreme regret that I feel that I must advise you that I cannot make the Class Reunion on June 17. I had fully planned on doing so, but my affairs at the present time are in such a turmoil that I do not feel it advisable to leave them, even for a short time. This might seem to indicate insufficiency of organization, but there is a certain conscience right now that seems to prompt me to pay first attention to trying to 'keep the ship afloat' and this is what I feel I must do. My little business affairs are still solvent and I am afraid may not stay so without the best attention they can have, and the coming summer will, therefore, find my nose pretty close to the grindstone.

"If you find time to do so, I wish you would give the fellows whom I know in the class, and especially those in our course, my kindest regards and best wishes for many happy and prosperous years to



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come, and tell any of them who may at any time migrate to or through this country to be sure and call on me if the spirit moves."

Addison is President of three corporations: Addison Miller, Inc., railroad contractors; Great Northern Icing Company, railroad icing facilities; and Commercial Investment Company, investments. He has never married; address, 1111 Builders Exchange Building, St. Paul, Minn.

W. Watters Pagon, consulting engineer, 1308 Lexington Bridge, Baltimore, writes that he is now doing research to consolidate fluid mud 24 feet deep, density 82 pounds per cubic foot, fluidity almost 100%. Also research in structural design of airships, gas holders, and so on. He has won a \$5,000 prize from the United States Navy for a new type of rigid airship structure. He is applying aerodynamics to numerous problems; such as, cavitation, design of special valves for handling fluids, semi-fluids, dry dust, and so on. He has been a special lecturer at Johns Hopkins Engineering School for the past three years on airships, aerodynamics, and hydrodynamics. Pagon is married and, with three children, lives at 114 St. Johns Road, Roland Park, Baltimore. — BRYANT NICHOLS, Secretary, 19 Rowe Street, Auburndale, Mass. HAROLD S. WILSON, Assistant Secretary, Commonwealth Shoe and Leather Company, Whitman, Mass.

## 1909

The following notice of the death of Marion Foss appeared in the *Chicago Tribune* for August 29, 1932: "Marion Henry Foss, 47 years old, of 5448 Cornell Avenue, died yesterday after a long illness. He was a son of the late Gus Foss, prominent member of the Chicago Board of Trade, and a nephew of Thomas E. Wilson, the packer.

"For the last three years Mr. Foss had been consulting engineer for the United Chemical and Organic Products Company of Calumet City, a subsidiary of Wilson and Company. For seven years previously he had been a consulting engineer for the parent organization. Mr. Foss was born in Wilmette and educated at Stamford and Boston Technical College. He worked as a mining engineer in Nevada after leaving school.

"In 1915 Mr. Foss married Elisa Opydyke at Salt Lake City. Mrs. Foss and two children, Charles and Martin, survive. Other survivors are his mother, Mrs. Gus Foss; two brothers, Frank K. and Samuel B. Foss; and four sisters, Vera Foss, Mrs. Clifford Brown, Mrs. Aldrich Harrison, and Mrs. James Ballard."

John C. Bollenbacher, of the firm of Granger and Bollenbacher, was the author of an article in the September number of the *Architectural Record* on the general subject of how an architect can obtain the quality of materials and workmanship contemplated by his design by requesting the general contractors to submit with their bids a complete list of subcontractors, with their respective sub-bids.

He suggests that after the contract is let the list of subcontractors should only be changed with the approval of the architect, and provided the owner accepts adjustment in the contract price. This method, he believes, is fair to the owner, the contractor, and the subcontractor.

John Willard's daughter, Marion, is entering Wellesley College this fall. — The Secretary was glad to have a call from Paul Wiswall, and wishes that other members of the Class would drop in to see him on their way through Boston.

In a recent letter from Edward S. Howe, who is with the Brooklyn Edison Company, he writes:

"I enjoyed a round trip on the Fall River Line with Francis Loud at Memorial Day time, and over the Labor Day week-end I had a glorious time at Beacon, N. Y., with Austin Keables and family. There was swimming in the Hudson River and boating in his sailing canoe.

"On the Fourth of July, I took part in a grand little clambake on Squish Beach in Plymouth (Mass.) Harbor with two sons of two former Technology men, and next morning started a hurried trip to Idaho to visit my mother before my two weeks of vacation ended. — Francis Loud preceded me to the Pacific Coast by about a fortnight." — CHARLES R. MAIN, Secretary, 201 Devonshire Street, Boston, Mass. PAUL M. WISWALL, Assistant Secretary, General Foods Corporation, 250 Park Avenue, New York, N. Y. MAURICE R. SCHARFF, Assistant Secretary, One Wall Street, New York, N. Y.

## 1910

George Humphrey, VI, writes from Maryland: "Replying to your plea for some news, I am still located in Hagerstown, Md., as Vice-President in charge of operations and engineering for the Potomac Edison Company. My older boy, Arthur, apparently not being favorably impressed with the record of the Old Man as an engineer, has decided to take up economics and finance. Since M.I.T. does not provide a course in these subjects, he is entering the Wharton School at the University of Pennsylvania. My younger boy, George, has just entered high school. The entire family is enjoying the best of health.

"I see Bill Biedler occasionally in Baltimore, Bill Horton, in Pittsburgh, and Livingstone Ferris in New York. If we don't get more news in the class letter, I fear that most of us will soon be among the 'forgotten men.'"

Our famous classmate, Stuart Chase, is out with another book, "A New Deal," of which the New York *Herald-Tribune* says: "Stuart Chase — one of economics' brightest and most readable gifts to man — here takes a long breath and goes off the deep end into the infinitely complicated welter of our present economic disasters." — DUDLEY CLAPP, Secretary, 40 Water Street, East Cambridge, Mass.

## 1911

It was indeed a shock to learn in mid-September that Max Kushlan, VI, died in Mattapan, Mass., on August 5. Small of

stature, Max was the thorough, painstaking type, intensely interested in engineering problems and author of articles on electrical subjects, including an electrician's manual. His presence will be sorely missed at the Boston get-togethers of our class, which he attended with regularity.

In mid-September I had a nice call from a classmate whom I had not seen since Tech days, Carlton W. Eaton, XIII, of Gray, Maine. Eaton is now in landscape architecture with reasonable success, he avers. He is married, has two children, 12 and 8, and said he saw the eclipse with the Harvard University expedition perfectly in his home town.

Speaking of the eclipse, the weather man treated us badly here at Douglas Hill. For the first 50 minutes of the hour preceding totality it was beautifully clear, but dark clouds covered the 90%-covered sun at 3:20 P.M., E.S.T., and we lost the corona effect entirely, although at our elevation of 1,000 feet we saw the shadow cross the valley from Mount Washington in all clarity. All this despite the fact that we were honored by the presence of President Compton of M.I.T., with a family party, more than a score of foreign astronomers, members of the Royal Astronomical Society of England, and a houseful of guests. Bob Morse, VI, was here with his wife and daughter. He is still with the American Gas and Electric Company, 30 Church Street, New York City.

Over the last week-end in September I more than enjoyed what has come to be my annual renewal of acquaintance with Technology undergraduates, as I was the guest of the Technology Christian Association at the Annual Freshman Camp, just preceding registration. This is held at the Cambridge Y.M.C.A.'s Camp Massapoag, Dunstable, Mass., and my particular chore each year is to teach the youngsters Technology songs and cheers. Saturday morning a fine-looking youngster approached me and said his father was a 1911 man. It turned out to be Franklin Parker of Wellesley Farms, Ted Parker's oldest boy. He reminded me very much of Ted when he matriculated. — ORVILLE B. DENISON, Secretary, Douglas Inn, Douglas Hill, Maine. JOHN A. HERLIHY, Assistant Secretary, 588 Riverside Avenue, Medford, Mass.

## 1912

Your Assistant Secretary spent a part of his vacation this summer at Newagen, Maine, where "spruce forests and granite cliffs meet the sea." Dave didn't say whether he chummed around most with the granite, spruce, or sea, but did report a good time.

C. E. Morrow, IV, our Class Treasurer, can now be reached at 54 Oak Avenue, Glenbrook, Conn. Clarence sent regrets at not being able to attend the Reunion.

David Dasso (for many years associated with "El Vulcano," Callao) and family were passengers on the S. S. *Reina del Pacifico* for Havana, en route to New York, where he will be associated with the



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American office of Sulzer equipment. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. McGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York, N. Y.

## 1913

While Registrar Joe MacKinnon and your scribe were having lunch at Walker one day, toward the end of summer school, who should appear but Phil Capen — his first visit in over two years. Not much to offer except he was between jobs, his last employer having just felt the depression. Phil looked well and happy and said that his new job was almost clinched. So, good luck, Phil.

Now for the real news. George Bakeman of Paris appeared upon our threshold the other day. Your scribe had not seen him for over 12 years, but the mutual recognition was instantaneous. He has been on his tri-yearly furlough of three months, spent wholly in the States. Had a most delightful visit with Bakeman. Heard all about Paris as a home city, about the business life there, and so on. George drives a regular Model A Ford and has successfully avoided contact with the omnipresent Parisian taxicab. Mrs. Bakeman and the three children are to remain in the States for a while, at least — in Brookline to be exact — while the children attend the local public schools. For those who missed earlier news, Bakeman is office manager in Paris for The Rockefeller Foundation. — GEORGE P. CAPEN, *Secretary*, 50 Beaumont Street, Canton, Mass. ARTHUR L. TOWNSEND, *Assistant Secretary*, Room 3-435, M. I. T., Cambridge, Mass.

## 1914

Your Assistant Secretary, George Perley, made a trip to Boston recently and brought a little information to help out with these notes. Had it not been for this opportune trip, no notes might have appeared because there has not been a single communication from any classmate during the past month.

Perley reports that he has seen A. P. Shepard in New York and that Shep is still hoping that some one of the lines he has been following up will close with a definite assignment before long. Shep, it will be recalled, was in South America on electrical engineering work and, when the work was completed, came back to this country to find that a real depression was on.

A. S. Page has completely forsaken railroading and civil engineering as well as the building industry, with which he has been associated in the past. He is now an insurance specialist in Newburyport, Mass., and, in addition, is carrying on a side line of real estate.

R. F. Zecha, who decided to go into the textile business just before the well-known depression fairly settled on, reports that he is still hanging on but is patiently hoping for brighter days. He says that a little sunshine would look good to him not only from a business

viewpoint but also from the fact that it might warm the arthritis from which he has been suffering of late.

Frank Ahern, who is at the Bureau of Standards in Washington, was in Boston recently on his furlough time, now being required of all Government employees. Frank is hoping that the next Congress is not going to cut appropriations too drastically, or at least to the point where the work at the Bureau of Standards is seriously hampered.

Our Alumni President, Allan Winter Rowe, is making an urgent appeal for funds to help carry on the undergraduate athletic activities at the Institute. Each year the alumni, through their various classes, have made some small contributions which have been of tremendous help in this work. It is obvious that this year funds are needed more than ever. If any of you have a spare dollar, or even two, and if not a dollar, perhaps 50 cents, please send it along to your Secretary, who will forward it to the Athletic Council as a contribution from the Class of 1914.

It is only about 18 months to our Twenty-Year Reunion. Here's hoping that the present depression will be well forgotten by that time so that we can all join in a glorious celebration for returning prosperity! — HAROLD B. RICHMOND, *Secretary*, 30 Swan Road, Winchester, Mass. GEORGE K. PERLEY, *Assistant Secretary*, 21 Vista Way, Port Washington, L. I., N. Y.

## 1915

Another blessed event gives material for our vital statistics department. Ben F. Lapp, X, and Mrs. Lapp announce from Buffalo the birth of Douglas Marshall Lapp on August 20. Our heartiest congratulations to you, Ben, and Mrs. Lapp, and the best things in life to the new prospect for Technology. I recently saw Ben and his family in Buffalo. He is one of the few Course X men still a real chemical engineer, making azo colors at the Buffalo plant of the National Analine Company.

Early in the summer I wrote a personal letter to each of the 26 members of our class who are in foreign countries asking for a bit of news about them with comments on their positions and families, the economic, industrial, social, and geographic conditions in the land where they are. The first letter we have is from Ken Boynton, VI, from Mexico City: "In answer to the request contained in your letter of July 9, I report that I have been located in Mexico for the last nine years, with headquarters at Mexico City. All of this time I have been connected with the General Electric interests here, serving for the past two years as General Manager of the General Electric S. A. My family consists only of myself and my wife, Helen Wanstall Boynton.

"You ask for something with regard to the geographical, economic, political, and industrial conditions, but I believe that in general our classmates are familiar with the Republic of Mexico. We have here snow-capped mountains,

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rugged hills, huge plateaus, fertile valleys, tropical jungles, inland lakes, and ocean beaches — take your choice.

"Economically, Mexico has been hard hit, like all other countries, during the present depression, but relatively speaking not as severely as many other countries more highly industrialized. Mexico has splendid natural resources and a capacity to overcome obstacles and for recovery, so that there is a good prospect of conditions picking up here perhaps more rapidly than elsewhere.

"Politically, the situation here is relatively stable; revolutions recently have been almost conspicuous by their absence after a long period during which a revolution in Mexico was almost an everyday occurrence. The present government policy involves the building up of the industries of the country, and considerable progress has been made in this respect during the last two or three years. It is not to be supposed that Mexico will become an industrial nation for many years to come, since it is inherently an agricultural country and its industries should develop as a natural result of agricultural advancement and the development of its natural resources, such as mineral and petroleum deposits.

"I should be overlooking an important point if I did not take this opportunity to mention that this is a great country for the American tourist, who is always welcome here. Above, I spoke of the many and varied natural attractions and in recent years a well-planned and aggressively developed road-building campaign has been in progress. While it is possible to drive through from the Texas border to Mexico City, it would not be wise to do it during the rainy season (June to October). However, it is expected that by next year the national highway will have been reasonably well completed. It is now possible to drive over an excellent road for quite a distance from Mexico City. There is a short piece that has to be finished, however, through the mountain section. When completed, this will be a wonderful road to travel over. Once in Mexico City, the tourist finds a number of excellent highways branching out as do spokes from a wheel.

"Needless to say, I shall be delighted to extend a personal welcome to any of our classmates who may find it possible to visit Mexico City."

This is a splendid letter and I know we're all glad to hear from Ken and send him our thanks for responding so willingly. There are other letters to follow and it will be delightful to read of our men in these distant lands. Incidentally, if from thousands of miles away, a few of our good classmates can write in, can't some of you from only hundreds of miles away do a little scribbling? These foreign letters would last for all issues, you know! — AZEL W. MACK, *Secretary*, 379 Marlboro Street, Boston, Mass.

## 1917

Bennington College will now include on its faculty 1917's novelist and engineer, Irving Fineman. Engineer Fineman

1917 Continued

will lecture on Prose Writing and the Study of Literature, using as his texts, Peabody on Steam and Gill on Gas.

In August, I saw Alva (Peso) Moody in Denver and accepted his hospitality at his cottage in Bear Creek Canyon. His three husky children, Marcia, Dickie, and Eleanor, spend their time swimming in a pool that Peso has built for them to use when they are not fishing trout, gold, or, for that matter, silverware out of Bear Creek. Peso's business has been a bit quiet but is expected to improve when appropriations for civic projects are made available. He is a specialist in pipe lines and ducts for water and when you realize that that entire section of the country is watered almost entirely by irrigation, you will appreciate that he is in touch with most of the development and expansion activities of the nearby territory. He points with pride, for example, to the several local golf links and I gathered that without his efforts each would be one long continuous sand trap. He has put in many miles of pipe in Colorado and the adjoining states.

Barney and Mrs. Dodge were in Denver at about the same time for the purpose of climbing Long's Peak and incidentally to attend the Chemical Society meeting. The city had only recently recovered from its excitement when Dean Lobdell and Editor Killian sped through on their whirlwind tour of western M. I. T. clubs. — RAYMOND STEVENS, *Secretary*, 30 Charles River Road, Cambridge, Mass.

## 1918

From Harry Upson Camp comes the disturbing news that on Bunker Hill Day (June 17) he had an accident which has seriously interfered with his organ playing. It seems he was doing a little *extra curricula* carpentering at the Frazee Organ Company's plant, being sales manager for the same, when his right hand slipped into the blades of the buzz planer, cutting off parts of three fingers. The Malden Hospital did its best for a week, after which he went home and later to Maine for a rest during August. Fortunately Harry can still play, but there is a whole lot that must be learned over again. How much this means can be appreciated better when one realizes that Harry has a pipe organ in his home.

Frederick Philbrick, more power to his elbow, followed up that postal from Honolulu with a long letter written aboard the Los Angeles Limited: "The reason for my trip," he says, "was the Massie case. A complete reorganization of the police department was demanded. This led to improvements in the signal system and also a revamping of the fire alarm system, which was even more of a job. I arrived barely in time to avert the work being undertaken by local people who were not particularly well qualified to carry out the project. Among other things it was necessary to have a bill passed by a special session of the legislature. The city officials were well pleased with results as the undertaking will relieve unemployment; property owners

were delighted because the resulting deductions in their insurance premiums will total at least \$500,000 over a ten-year period; and I was not exactly saddened by the addition of nearly \$300,000 worth of business to my sales sheet.

"Between times Mrs. Philbrick and I combined a little pleasure with business. One trip took us to the Kilauea volcano on the island of Hawaii, about 200 miles from Honolulu. We sailed over and flew back, a most enjoyable experience. All that has been said in the tourist guide books and by Earle Derr Biggers in his Charlie Chan stories is well founded. Incidentally, the character of Charlie Chan was based upon an old Chinese detective named Chang Apana, whom I met at Police Headquarters, still on duty, although over 70 years old. He has just recently been retired. He takes great interest in his story-book namesake and attends all the movies of the stories with ceremonial dignity.

"I was there nearly four months and had an opportunity to see much more of the native life than the average tourist. Their customs are a strange mixture of the Orient and Occident. One of the best illustrations I could give you is that the beach boys and stevedores (usually part Chinese, Japanese, or native Hawaiian) eat their lunch sitting in a model T Ford, a hot dog in one hand, and eating rice with chopsticks in the other. When a Japanese couple get married, the girl wears her native costume, and the bridegroom, a tuxedo!

"As a melting pot, Honolulu is complete. The chief races are Japanese, Chinese, Portuguese, Hawaiian, Korean, Porto Rican, Filipinos, and whites. They all intermarry and I leave the results to your imagination.

"The local government of Honolulu is in the hands of very capable men, and entirely divorced from the graft and corruption of our American cities. In this respect they are exceedingly fortunate.

"Their main industries are sugar cane and pineapple growing. Due to their distance from the mainland, they have to be, and are, independent with regard to their essential industries. They have their own fertilizer and can factories, and the Honolulu Iron Works designs and builds most of their sugar mill machinery.

"It is interesting to note that the Islands were settled by Boston missionaries and whalers long before the Pacific Coast became populated. The Forty-Niners in California sent their children to school in Honolulu, since it was easier to reach than the eastern schools of comparable scholarship. Honolulu was formerly a great whaling center and the city was originally built around this industry. It appears much like our New England sea-coast cities."

Again it becomes our sad duty to close with the announcement of the passing of a classmate. Joseph A. Donovan of Cambridge died on July 2. — F. ALEXANDER MAGOUN, *Secretary*, Room 1-305, M. I. T., Cambridge, Mass. GRETCHEN A. PALMER, *Assistant Secretary*, The Thomas School, Wilson Road, Rowayton, Conn.

## 1921

George W. Spaulding, of the Safe Harbor Water Power Corporation, Baltimore, Md., collaborated with L. M. Davis, of the same company, in presenting a paper entitled "Safe Harbor Kaplan Turbines" at the October Baltimore District meeting of the American Institute of Electrical Engineers. George has spent considerable time on the design and development of these adjustable blade turbines at the Holtwood, Pa., hydraulic testing laboratory, which was constructed in order to carry out the test program for the equipment to be installed in the Safe Harbor hydroelectric development on the Susquehanna River.

Melvin C. Rose presented a joint paper with H. A. Russell at the same meeting on the subject of "The Use of Cables for Telephone Distribution Purposes." Mel is with the Chesapeake and Potomac Telephone Company of Baltimore City in the capacity of Outside Plant Engineer, 1210 Standard Oil Building, Baltimore, Md. Give our best wishes to Brother Oehm and his family, Mel, and this time don't blame Ray St. Laurent for the reference!

Ray writes that he has been working overtime all summer keeping the various wolves from the Rogers front door and then gives us the following news:

"John A. Facey recently dropped in and I learned that he is manager of the Springfield sales office for C. A. Dunham Company, manufacturers of traps, valves, pumps, boilers, and so on. John has recently moved from Buffalo and we are glad to have him here. He is married and has two fine boys.

"John told me that Paul L. Hanson is still in Buffalo, where he has been for the last ten years or so. Paul is Production Manager of Heinz and Munschauer, ice-box manufacturers, located at 20 Superior Street, Buffalo. Paul is married and has one youngster.

"John J. Healy, Jr., also was here and told me that he is Technical Advisor in the sales department of the Merrimac Chemical Company with headquarters at 148 State Street, Boston. He has been with these people for some ten years, originally in the research and manufacturing departments, and now is spending most of his time on the road contacting customers. John has been married about two and a half years and reports no family but does admit the possession of two tamed Mexican Sword Fish!"

Your Assistant Secretary has moved to the address noted below, where your news for these columns will be most welcome. — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, South Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, University Avenue, Chatham, N. J.

## 1923

A winter of strenuous traveling appears to be ahead of me and I suppose I should begin these notes with a date line. That's what Will Rogers does as he travels around, for the piece he writes each



1923 Continued

day for the papers. But then, he gets paid for it — and it helps to fill up space. I'm under no such necessity. Indeed, I fear that even this modest attempt at a circumlocutory introduction will be received with frowns by The Review editors and, in fact, may never get into type at all.

The notes this month should be dated from Portsmouth, Ohio, a principal claim to fame of which is that it has a professional football team (made up of former college stars). Locally they are very proud of this team since it plays in a league, the other members of which are teams from Chicago, New York, Boston, and Brooklyn. If I finish these notes soon, I can get out and see the game they have with New York this afternoon.

Children's vehicles and firearms may not appear to have much in common, but Penn Howland, XV, reminds me that that's what Iver Johnson makes. He's been with the Iver Johnson plant at Fitchburg, Mass., since graduation. He raises the question of whether anyone is doing anything about a ten-year reunion next June. Pete Pennypacker, XIII, asked the same question in a recent letter. So far I regret to report no definite plans have been formulated. We'd appreciate some specific suggestions. Pete says the New York boys would like to have it near home — say at some resort in Connecticut. He discussed this with President Bob Shaw, he reports, but no conclusions were reached.

Pete reports having seen Sam Williams, III, the other day. Sam has recently been convalescing from an appendicitis operation at Enfield, N. H. Lem Tremaine spent part of his vacation at Lake Placid. Lem has been playing considerable tennis, being runner-up in a tournament at Lake Placid and when Pete wrote, he was playing in finals at Westfield. Pete also reports having seen Tom Boyd, XIII.

Dr. John A. A. Sullivan, III, writes me he expects to be in Boston this winter. The Secretary of the Minneapolis Technology Club reports the death of John B. King, XV, on July 27. King was with Sears-Roebuck Company and is survived by a widow and one child.

An all-college male chorus of Zeigfeld's "Show Boat" in New York this summer reported by the New York *Journal* included Earl Sanborn, XIV, who, it will be remembered, described in the notes a few months back how he happened to get into stage work. — Dave Kaufman, X-B, dropped in to see me some weeks back. He's a consulting engineer specializing in oil burner installations and fire protection work in New York City.

I have an address change indicating Art Hill, II, has moved from Denver to Seattle. And, for the benefit of those who didn't see it last month, note your Secretary's new address. — HORATIO L. BOND Secretary, 195 Elm Street, Braintree, Mass. JAMES A. PENNYPACKER, Assistant Secretary, Room 661, 11 Broadway, New York, N. Y.

## 1926

On September 4 the engagement of Morton C. Swift to Miss Ruth Francis Holt of Albany, N. Y., was announced.

The following bit of journalese about an eminent member of the class recently appeared in a Montana newspaper: "E. C. Van Blarcom of the zinc roasters, who has the graveyard shift all alone, was startled by the sound of a mysterious tapping while on shift. Through being the victim of so many practical jokes at the zinc plant, Van has developed a spirit of cautiousness and thought he would, this time, turn the tables on the practical joker. He moved stealthily in the direction of the sound. For a brief instant Van admits he came awfully close to believing in "Spooks" because, though he was at the source of the sound, he could see nothing that could cause it. He was just on the point of making himself scarce when a new burst of sound broke the stillness and the mystery was solved. In the gray light of the breaking dawn, Van saw a woodpecker industriously drumming on an iron pipe."

That's all, there isn't any more. — J. RHYNE KILLIAN, JR., General Secretary, Room 11-203, M. I. T., Cambridge, Mass.

## 1928

The political dopesters claim that 1932 is a democratic year. That may be, in national political circles, but it certainly is in our Class for big news is just around the corner for the '28 democrats. Readers of this column will recall that the '28 democrats bore the title "Jopesonian democrats" after their genial, two-fisted, log-rolling, State of Maine headliner, Ralph T. Jope (the "T" stands for neither Technology nor Titus as often suggested).

Up to October 22, 1932, our jovial Ralph was a single man, happy but lonesome, so on the above date the tattered single remains of Jopesonian democracy journeyed to that historic city of Trenton, N. J., to become the newest '28 benedict. Congratulations, therefore, are much in order for our fortunate old "side-kick" and classmate, Ralph Jope, and best wishes are also in order for our most charming and equally fortunate "First Lady," Mrs. Ralph Jope, née Florence E. Clayton. The couple will be living at 410 Memorial Drive, Cambridge, and Ralph has already asked that I extend his invitation that you drop in and see him and our "First Lady" (especially the latter — this addition made by Ye Secretary) when you are in Cambridge.

From the office of Colonel Locke we have just received the following memorandum regarding Blackie: "Harold Blackwood, who was for a long time after graduation around Parral, has now moved over to another unit at Compostela in the State of Nayarit. After his visit to Boston in 1930, he was Chief Engineer at Parral for about two months and then took the job of Shift Foreman in the mine, which he held through 1931. Last January he was transferred to Angangueo, in the State of Michoacan, as Chief Engineer. Last May he was again moved, and this time to a small gold mine in the State of Nayarit. The mine is about four kilometers from the railroad and there is no track or road, so that all

shipments in and out are by burro pack train from Compostela, the nearest shipping point. Production now amounts to about 400 tons of ore a month, but this could be increased to 1,000 tons if a road was provided. Blackwood and the Superintendent constitute the entire staff, and Blackwood is combined engineer, mine foreman, cashier, master mechanic, and so on, with the expectation of having to do assay work in the near future. Since the mine is located only 600 feet above sea level, and 15 kilometers from the Pacific Ocean, the air is warm and humid and the climate is rather unhealthy, more or less malaria being prevalent. Blackwood is saving his money in the hope of being able to attend the five-year reunion of his Class in June."

Graduates of Course XVI will remember Frank Wattendorf, a graduate student who finished with our Class. Frank is a member of the Guggenheim staff of aeronautical experts at Akron, Ohio, and despite his youth he is rated as one of the leaders of aeronautical research in the world today.

Congratulations, Jack Connelly! We were very glad to hear of your marriage last month to Miss Frances Louise Bastness of York, Pa. Jack is now a supervising engineer in the Syracuse office of the York Ice Machinery Corporation. — Another Jack, this time Jack P. Luby, of St. Paul, Minn. (being from Minneapolis, that's the only thing we hold against him), also joined the ever-growing line of benedicts last month. The new Mrs. John Luby was formerly Miss Anna R. Riley of Hyde Park, Mass., and is a Radcliffe alumna. Twenty-Eight extends its wish for happiness to this new couple.

One more '28 man comes to life in the person of Bill Grunwell, XIII, who, until the following letter, has been silent about his whereabouts since graduation. Bill's letter was addressed to Gil Ackerman and then forwarded to me. Gil is now with the Luckenbach Company and is living at 6356 Broadway Terrace, Oakland, Calif. To quote from his letter: "I believe this is the first time I have written you since graduating way back in '28 and this was caused primarily by there being very little worth writing about. First, I went down to Newport News and worked as a computing draftsman in the engineering department at the shipyard for a little more than a year. Most of the calculations I made there were on standardized forms, but I learned a few things and did a little work out in the shops as well as on the ships. I had a strong preference for the work outside on the ships and decided to make a connection with the United Fruit Company, which I have been with for over two years, and I am called a marine draftsman. All of my time with this company has been spent here in New Orleans except for a few trips to Mobile to look after repairs."

"Last summer, my left ear kicked up and put me in the Hospital for about two months. I had a mastoid and a brain abscess and came mighty close to departing for the next place but am in good



1928 Continued

health again now." — GEORGE I. CHATFIELD, *General Secretary*, 420 Memorial Drive, Cambridge, Mass.

## COURSE VI

Hope I'll be pardoned for beginning with myself. When the curve of business activity continued to droop through 1931, it was decided by the powers that direct the sales destinies of the Electric Machinery Mfg. Company that whatever talents I might have could be employed to much better advantage in their New York office rather than in Boston. As a consequence thereof, on the first of November, 1931, I took residence in Flushing, L. I., and proceeded to be carried on the payroll of the New York office. Still with the same company, hold the same job, but not quite the same pay, in keeping with the trend of the times.

Since coming to New York I have been rooming with Bob Peatfield here in Flushing, and except for an occasional business trip to Philadelphia or Boston have remained pretty close to old Manhattan. By the time you read this, however, our happy home will be broken up, for an announcement of Bob's marriage on October 15 has just reached me through the mail. The young lady is Miss Alice Gertrude Forshee, daughter of Reverend and Mrs. Archibald Alexander Forshee of Dorchester, Mass. Congratulations from the Class, Bob. Bob is still with New York and Queens Electric Light and Power in their Flushing office.

Had lunch with Vic Decorte who has been with Commercial Cable Company for several years. Vic returned to this country in June from a ten months' sojourn in the Azores, where he was assisting in installing and putting into operation a new transatlantic cable station. From what Vic tells of his life there, it is the ideal place for engineers to work in a depression, the only drawback being that there is little work there at any time. But the cost of living is the bright ray in one's exile there. Vic tells of living on the fat of the land — champagne at dinner every night — for \$80.00 a month. Your Secretary has tried something similar on occasion here in little old New York, but found it couldn't be done on anything like \$80.00 a month and so has quit trying.

Through Vic comes word that Ernie Kashar, Harry Blanchet, and Ted Pierce are still with Brooklyn Edison, as was announced in these columns in the "dear dead days beyond recall" when business was good and everybody was sure it was going to be better.

Francis Stetson, who is also with Brooklyn Edison, was married about a year ago but details are lacking. Any assistance on this event will be appreciated.

Johnny Russell is now on the staff of the Electrical Engineering Department of Columbia and is beginning his second year there. Mr. and Mrs. Russell will be living in Jackson Heights this year, I understand, and since it is only a few

subway stops from Flushing, I'm hoping we can get together once in a while. How about it, Johnny?

Had a telephone call from Ernie Knight during the summer. Ernie is now with the refrigeration division of Westinghouse and at the time he called he was deep in an air conditioning installation here in New York. Westinghouse has recently gone into the air conditioning field on a very extensive scale, I understand. Ernie is doing development engineering and in connection with it is called on to supervise installations at times.

Abe Goldstein is still in the Patent Office at Washington, where he is studying patent law in his idle moments. If the fees our company pays its patent attorneys are any criterion, it is about the best "racket" an engineer could hope to find. Here's luck with the law course, Abe.

Bill Murphy and Fred O'Brien are with New York Edison and still keeping their bachelor quarters in New York. — Jim Ryan is in the New York office of Westinghouse, engaged in outside sales. — Rumor has it that "Red" Walsh is located in the vicinity of Albany with Mohawk Hudson Power but confirmation is lacking.

Ikehara, our representative from the land of orange blossoms, whom Jerry O'Neill, the foundry instructor, insisted on calling Mike O'Hara, got his Ph.D. at the Institute some time ago. At last reports, he was on the Institute staff teaching physics or chemistry.

Marsh Fay, who started out in Course VI but transferred to XVI recently broke into national prominence. After getting through at the Institute, Marsh took the advanced army training course at Kelley Field and after spending a year or so as a regular army pilot landed with National Air Transport. For over a year, Marsh has been co-pilot on one of the trimotored ships of N. A. T., flying at times the Newark-Cleveland hop, and again the Cleveland-Chicago hop. The incident that brought our usually shy and retiring classmate into the spotlight of national publicity is related in the following clipping under the heading "Stencil" from a recent issue of *Time*: "In Newark, N. J., Pilot Marshall Fay last January bought a dollar suitcase, had his name and address stenciled on it. After he finished using it he gave it to a traveling friend with instructions to throw it away. Month later the suitcase was returned to Marshall Fay by airplane collect. In Newark, he threw it away again. Before long he received a collect telegram from Boston announcing that the suitcase was found, was *en route* to Newark, collect." The moral, Marsh, is quite obvious. Don't put your name on a suitcase.

I sure would appreciate hearing from any of you fellows around New York, either during the day at the office or at home, Flushing 9-3639-W. I'm still single and so available on pretty short notice, barring prior engagements. — PETER H. KIRWIN, *Secretary*, 42-16 Saull Street, Flushing, N. Y.

## 1930

## COURSE VI

I have heard of another marriage involving one of our classmates. I believe that it was in May this summer that William F. R. Griffith, Jr., embarked upon the uncharted seas. It is rumored that the lucky girl comes from Washington, D. C. Bill is reputed to be in Rochester, N. Y., at present.

Ed Pritchard was expected back in the United States in September, after having spent a very interesting year studying in Europe. I understand that he spent a month working in the laboratory with Madame Curie. Just another reason for the Course to burst buttons off its vest — that's Ed.

I have learned from Miss Hunt that Red Rogers is working for the Eastman Kodak Company, at Rochester. — As everyone should know, Granger Schrader is doing well with the Philadelphia Electric Company. I understand that he and his wife are living in Narberth, Pa. — Leonard Wechsler is back in his home town, Chicago, working for the Crystal Tube Manufacturing Company. When he answers my letter I'll be able to tell what he is doing.

Speaking of letters, I expect to visit Camden, N. J., soon to find out why Frank Burley and Wanny don't answer theirs. — George Schaible recently dashed off a long letter to me. He is trying to find out how and why a machine switching central office works, just at present. I intend to take advantage of his cordial invitation and visit him soon at his apartment in Albany. — EARL E. FERGUSON, *Secretary*, 60 Eaton Place, East Orange, N. J.

## 1931

A letter from Gil Roddy indicates that he is very well satisfied with his job with Chase, Harris, Forbes in New York. Joe Birdsell, Gil's old running mate, is taking his Master's degree in the Department of Business and Engineering Administration as the John R. Macomber Fellow under the department's sponsored fellowships.

John Dyer has returned to the Institute to take graduate work — I think in the Department of Electrical Engineering, although I am not absolutely certain about this last fact. — Irving Finberg has also returned to the Halls of Learning. He has decided to become a lawyer and is going to the Harvard Law School, after facing the cruel, cold world for a year.

Bill Jacobs, Al Vorce, and Arsène Morin have gone into business for themselves. They are in the oil and gasoline business, having invented some sort of new process. — Tom Rosborough has been taking some courses at the Institute this summer. Also around the Institute is Red Nickerson, who is doing research work, in which he is very much interested.

Until next month then, when we hope to have a little more news, good luck. — JOHN M. MACBRAYNE, JR., *General Secretary*, Room 1-181, M. I. T., Cambridge, Mass.

## 1932

Word of plans for Ted Harding's marriage to Miss Elizabeth Beckwith, Wellesley '30, on August 20, has been received. Ted will be remembered as the leader of the Banjo Club.

The new Secretary for Course IX is Almer H. Orr, 604 Pitcairn Place, Pittsburgh, Pa. He is going to try to keep track of you fellows in Course IX, but remember that he needs your help.

At this writing William Kirkpatrick, Secretary for Course X, could not be reached, but Colonel Locke turned in the following memorandum: "Mr. and Mrs. Burt Dwight Stevens announce the marriage of their daughter, Catherine Hewlett, to Robert A. Gerlicher on Saturday, July 23, at Evanston, Ill. Gerlicher graduated from Course X-A in January, 1932, and is associated with the Goodrich Rubber Company in Akron, Ohio. He and his bride made a combination business and belated honeymoon trip early in September and he dropped in at Technology at that time."

Remember, your help is necessary to keep this news-gathering organization growing. — CLARENCE M. CHASE, *General Secretary*, Chase D 33, Soldiers Field, Boston, Mass.

## COURSE I

The Civil Engineering graduates seem to be unfortunate as far as securing positions is concerned. Lupe Vélez has gone back to his native country, Ecuador, to become one of the promising young engineers there. Bob Thompson is an inspector for the Department of Health of the State of Maine, while Chuck Thayer is with the State of Indiana. Henry Mitchell has spent the summer touring Europe, paying particular attention to the larger bridges in England, Scotland, and Germany.

Some of the Class will return for graduate work at the Institute. Among those are Bridgham, Chayabongse, Eliassen, McGilvra, Mitchell, and Miller. The Tau Beta Pi Association has awarded one of its fellowships to Eliassen for advanced study in hydraulics. — ROLF ELIASSEN, *Secretary*, 225 Orchard St. Belmont, Mass.

## COURSE II

Joseph Welch, Jr., has been awarded the annual scholarship to the Babson Institute by the Board of Selectmen of the Town of Wellesley from among about a dozen local candidates.

Blacky Powell's engagement to Miss Eleanor Griggs was announced this summer. — NORMAN O. PAQUETTE, *Secretary*, 172 Sandwich Street, East Windsor, Ontario.

## COURSE III

Course III is off to a flying start — on the wings of Cupid: Mr. and Mrs. Bernard Thomas O'Brien announce the marriage of their daughter, Margaret Loretto to Mr. Otto Charles Chapman on Sunday, July 10, at Lakeland, Fla. Congratulations, old man! Chapman is employed by the Phosphates Recovery Company, where he is enjoying the work, but associations with insects and reptiles has not as yet produced any entomological or herpetological propensities.

Haynes, Bearce, and Demas, with a fourth fellow not from Tech, set out at the beginning of the summer to pan gold in Idaho. Except that, from last reports, the amount of gold found has been in keeping with the depression, they were having a good summer and were thriving on their own cooking. Their non-Technology partner left shortly after starting, and Demas left on his own about three weeks later, but apparently to no avail as he has been seen back in Cambridge.

More depression reasoning is evident in Ben Chadwick's looking for a job in a gold mine. Thus would we all. — Orne has returned to China, but stopped on the road to study mining operations around Denver. "Thar's gold in them thar hills," also. — S. E. Lambert did a little surveying in the Coeur d'Alene district of Idaho this summer, but is now back in Cambridge.

Idaho was popular with Tech Alumni this summer as, in addition to those already mentioned, three more — H. M. Quigley and Al Dietz, IV-A and XVII, respectively, and Chapin — traveled over the northern half of the country in an old "T" Ford and spent many days in Idaho.

It isn't such bad country even in a Flivver. — H. J. CHAPIN, *Secretary*, 101 Ardmore Avenue, Ardmore, Pa.

## COURSE VII

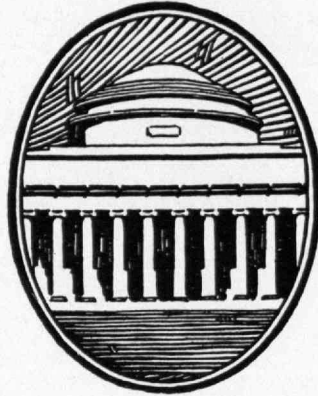
Isaac H. Schwartz, Somerville, loafed all summer, leaving for the University of Bonn, Germany, in September to study medicine. John Nickerson is working part time for Dr. Proctor of the Biology Department. George Green is doing nothing in particular, vacationed this summer at Sagamore Beach. Anita K. Sarabia worked in the Sargent School Camp in New Hampshire during the summer and returned to Technology to work for a C.P.H. this fall, also to do part-time work under Professor Turner of the Biology Department. Julius Boody rested for the summer, waiting for a job to show up. Elliot D. Giddon is entering B. U. Medical this fall. Bernard Gould is entering Oxford University. Henry Shwachman is entering Johns Hopkins Medical and Joseph Stowell is entering Columbia Medical. HENRY T. SMITH, *Secretary*, 77 School Street, Braintree, Mass.

## COURSE XVI

Randolph Field, Texas, has welcomed John F. Strickler, Edward S. Allee, Edwin A. Eddy, and Reginald R. Lundstrom into its midst. John W. Jewett is also with the Government but with Naval Reserves at Pensacola, Fla.

Curtis Cummings, Frank R. Cook, William C. Schoolfield, and Isabel C. Ebel have been looking for a job, are looking for a job, and will be looking for a job. William I. Stieglitz has been working all summer on the Engineering Staff of Herren Aeronautical Corporation, Barrington, Ill., mainly stress work. He expects to continue during the fall and winter. Thorndike D. Howe, Jr., has been developing and marketing various inventions.

Z. Lewis White is attending the Harvard Graduate School of Business Administration. The following men expect to return to Technology for more knowledge: Robert K. Mueller, Lowell M. Moses, Morris Erstein, and Nathan Paris. — JOHN LAWRENCE, *Secretary*, 17 Washington Street, Rutland, Vt.



# INFORMATION

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**T**HE TECHNOLOGY REVIEW BUREAU exists to supply authoritative information to anyone interested in details regarding the Massachusetts Institute of Technology. It serves as a clearing house for inquiry and aims to further the spread of exact information regarding entrance requirements, outline of courses, subjects of instruction and other information which may be of aid to the students considering undergraduate or graduate study at the Institute.

The Institute publishes a variety of bulletins, fully descriptive of individual courses, as well as a catalogue of general information essential to the entering student. The Technology Review Bureau will be glad to send, gratis and post free upon request, one or more copies of any publication listed below, or to forward any special inquiry to the proper authority.

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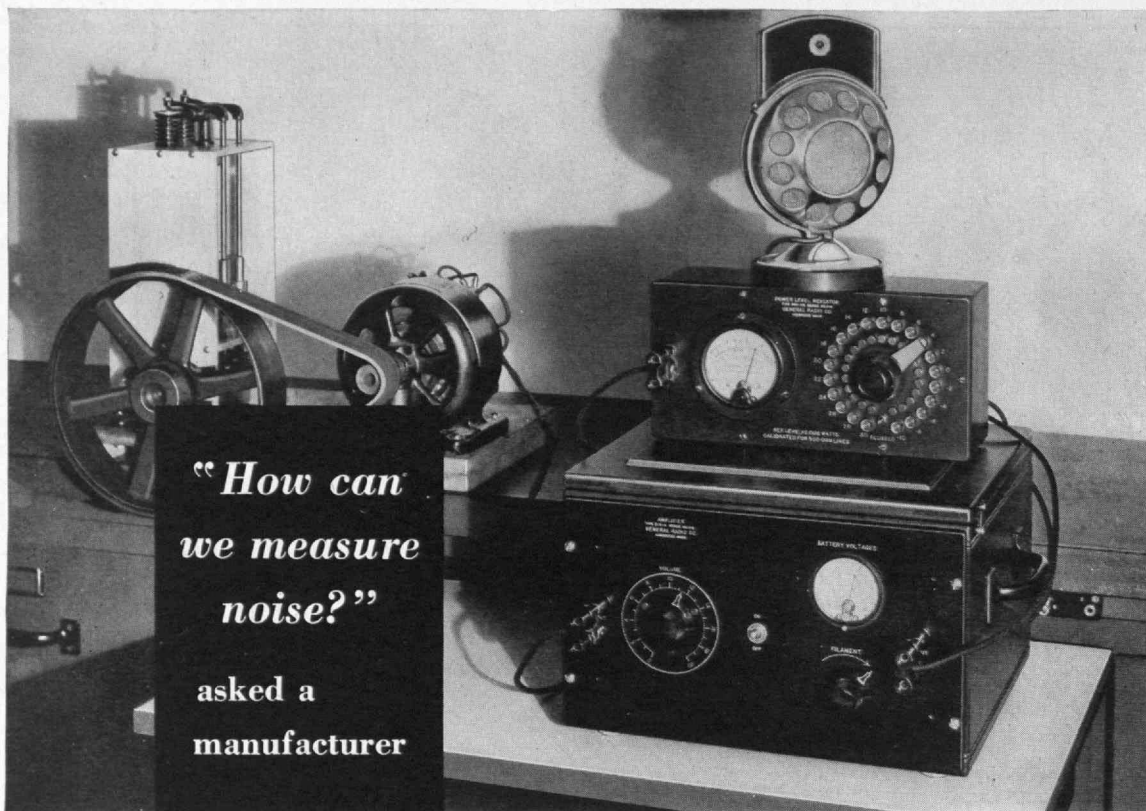
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## THE TECHNOLOGY REVIEW BUREAU

ROOM 11-203, MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
CAMBRIDGE, MASSACHUSETTS





*"How can  
we measure  
noise?"*  
asked a  
manufacturer

*... and here's the answer!*



The amplifier in this installation is a General Radio TYPE 514-AM Amplifier having three stages of resistance-coupled

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The output voltmeter is a power-level indicator used in broadcast and movie recording studios for monitoring the sound level. It has a range of  $-20$  to  $+36$  decibels.



THE machines we manufacture have a minimum noise clause in the installation contract. How can we measure noise for the acceptance tests?" That was the problem put up to us by a large manufacturer of compressor type machines working in a highly competitive field. Low cost, compactness, and simplicity were to be essential elements in this acceptance test.

Our answer was the equipment shown in the accompanying photograph. It consists of a three-stage resistance-coupled amplifier, a voltmeter calibrated in decibels, and a conventional carbon-type microphone, all commercially available pieces of apparatus intended for work in other fields. Noise is picked up by the microphone, amplified in the amplifier, and the intensity indicated by the meter.

To make the acceptance test the noise level is measured in decibels with the compressor stopped, then the compressor is started and the increase in noise level read directly from the dial of the meter. This is an accurate measure of the noise produced by the machine.

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